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**FACTORS RELATED TO TEACHER USE OF COMPUTER
TECHNOLOGY IN MALAYSIA**

By

Norhayati Abd. Mukti

A DISSERTATION

**Submitted to
Michigan State University
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ABSTRACT

FACTORS RELATED TO TEACHER USE OF COMPUTER TECHNOLOGY IN MALAYSIA

By

Norhayati Hj. Abd. Mukti

Providing facilities and training for teachers to use computers effectively in their classroom instruction is not sufficient. There are many other factors that need to be examined in order to ensure that teachers will use computer technology effectively in their classroom instruction.

In Malaysia, the education ministry has been supporting the setting up laboratories and computing equipment in schools in various places in the country and a great deal needs to be learned about the circumstances under which teachers will make effective use of that equipment.

This is a study of the major factors that relate to teachers' use of computers in their teaching. Sources of data include questionnaires, interviews, and laboratory observations. The data was based on four classes of variables: (a) general context, (b) teachers' background characteristics, (c)

attitudes and concerns, d) experience using microcomputers, and (e) level of use of computers in the classroom (dependent variables).

In the data analyses, in order to reveal a clear relationships how people were perceiving about the use of computers, a more intensive analyses were used besides the simple analyses. The major findings of this study are that (a) context factors such as full administrative support, financial, and in-service training were very important and strongly relate to how they used computers in their teaching, (b) teachers' backgrounds characteristics such as experience teaching with computers, amount of training attended and computer knowledge made a great difference in the of degree of classroom computer usage, (c) teachers showed positive attitude towards the use of computers. They perceived that training that adapted to their concerns and needs and linked to their own practice can increase their effectiveness of computer usage, (iv) experience using computers, they perceived that there are some barriers in the past still remain as barriers at present.

Some of the implications of this study are that: (a) to ensure that teachers use computers effectively in their teaching, the education ministry should be more sensitive to background characteristics of who should be the computer teachers, (b) the types of equipment, software and training should be organized to meet specific concerns and needs of teachers. The overall conclusion is that effective computer usage is influenced by a variety of factors.

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LIST OF ABBREVIATIONS

Abbreviation used in 3-D plot, and drop-line graph.

LEVINT	Level of interest towards use of computers
BASIC	Basic
PASC	Pascal
USECOMHM	Use of computer at home
PRIORTR	Use computer prior to training
AMTTRAI	Amount of training
CHNGUSEC	Changes in use of comp
CONFP	Confident in use of comp.- the first 6 mths
CONFPR	Confident in use of comp.- at present
SATISF	Satisfaction
MEANFUL	Meaningfulness
ADEQ	Adequacy
INSEROWN	In-service training related to own instructional practice
FOLLWTRN	Degree of follow up training
STAFFDEV	Amount of staff development or training
SUCCEF	Successful
RELV	Relevant
USEFU	Usefulness
OTHTEAR	Other teachers(day to day)
SCHCOORD	Sch. comp. coordinator/aide
CONSLT	Consultants, organized group of teachers
SOFTWREP	Software company rep
HARDWREP	Hardware company rep.
RESOURCP	resource person
FINANSUP	Financial support
PRINCIP	Principal
TECHNC	Technical
FINANCIA	Financial
ORGNIZSU	Support from the organizer of the training (MOE/District)
LABASSIS	Computer lab assistant
REFBOOKS	Support in term of Reference books
DISCOMIS	Teacher discussed issues related to use of comp
OBSRVTEA	Observed other CIE teacher
SIMILUSE	Similarity in used of comp
CLASSNUM	No. classes in a typical week
DAYS	No. of days a week
(Cont.)	

PERIODLA	No. of periods use comp. lab in a typical day
MINUSECO	Amount of min. classes spend using comp. each week
LACKSFTW	Not enough software
LACKHDW	Not enough hardware
LACKTIME	Not enough time to prepare
LACKKNOW	Lack of computer knowledge
MANYPERI	Too many periods given to teach other subjects
COMBREAK	Computers always breakdown
LABOCCUP	Computer lab always occupied
TIMECRN	Time-related concerns
SOFTWCRN	Software-related concerns
CLSSMGCR	Classroom management-related concerns
COMKCRN	Training/computer knowledge related concerns
STUDEKNO	Students more knowledgeable in using the compt.
INSOWNCR	In-service training adapted to own concern and needs
INTEGRCO	Integrate comp. into content areas
MORETRN	Needs more training
COMEACHC	At least one comp. in each classroom for stud. and teacher to use
SPECLIZT	A specialized CIE teacher
INEXAM	CIE should be included in the exam
ENGLANG	English Language
COMFORT	Comfort
EASYUSE	Easy to use computer
CONFIDEN	Confident
SPELLCHK	Spelling checker
WP	Wordprocessor
RECDKEEP	Record keeping
DB	Data Base
SPREEDSH	Spreadsheet
GRAPH	Graphing
DRAW	Drawing program
OTHERSOF	Other software
BASI	BASIC
TUTORIAL	Tutorial program
DRILLPRA	Drill-and-practice program
PROBSOLV	Problem solving program
MICROWL	Microworld
GAMES	Games
ONEWAY	One-way presentation
TWOWAY	Two-way presentation
WORKGP	Working in groups
(Cont.)	

WORKIND	Working individually
OWNEXPLO	Student explore on their own
DRILPRAC	Drill-and-practice program
COMPINST	Computer instruction program
OWNPRODU	Own production
REMEDIAT	Remediation program
GAMEDRIL	Game-drill like program
ENRICHME	Enrichment program
DBASE	Data base program
WPROCESS	Wordprocessor
SPREADST	Spreadsheet

CHAPTER ONE

Factors Related to Teachers Use Computer Technology in Malaysia

Introduction

In Malaysia, the Education Ministry instituted a program, "Computer in Education (CIE)," which is a nationally sponsored program designated to target education teachers as ones who will incorporate computer technology into their classroom instruction. In the program the government provided equipment to schools and training for teachers to make use of the equipment. Those schools and teachers are the central focus of my study.

The central purpose of my study is to find out what other factors are associated with teachers' effective use of educational technology in their classrooms. In this study my contention is that the variables that associate whether the teachers in these schools make effective use of computers or not are not especially related to what the government had been doing. In other words, I do not think that having the equipment and training is the key to who uses the equipment effectively and who does not. The computers and training are a top-down process, but I think that there are other factors which are related more to bottom-up use that are about teachers and how the

training and equipment have an impact on these teachers-that need to be looked at.

The aim of this study was to investigate the variables associated with why teachers did or did not use computer technology effectively in schools. The goal was to find out the relationship of several classes of variables with uses of microcomputers.

In the study I was trying to identify and differentiate among teachers who were making uses of the technology and use this as a basis for trying to understand why some teachers are making more effective uses of technology than others.

In Malaysia there are few research findings concerning how CIE teachers use computers in their classroom instruction, factors faced by teachers that hinder effective usage of the computers or factors that are conducive to its usage. Findings from this research study will help in making recommendations for teachers to use computer technology effectively and efficiently in their classroom instruction.

Review on Importance of Technology in General

The importance of technology in education has featured very prominently in the literature of educational innovation. Computer technology is one of the instructional technologies thought to be a very useful tool for teachers for several reasons. (1) Computers can be used as a tool to enhance, enrich, or augment a student's ability to think.

Students who know how to word process can use the computer to help organize their thoughts and enhance their creative thinking while writing essays or reports. Students knowledgeable about working on a

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spreadsheet program can develop their higher order thinking skills by considering the impact a variety of calculations may have on a problem (Bruce, 1990, p. 33).

(2) Computers can enhance education throughout the provision of active learning in a variety of sensory modes, as well as provide students with sustained attention and consistent responses.

The computer offers the possibility of individualizing instruction and simulating the real world, and in doing so, the learning process can be made more interesting, challenging, and effective (Smallen, 1989, p. 10).

(3) Computers have a potential role in higher-order thinking (Patterson and Smith, 1986) .

Properly designed, applications of computers can allow students to formulate hypotheses, test them, analyze results, and refine their conceptions. Moreover, they can provide the student with a record of the course of his or her investigations, permitting greater self-awareness of thinking and learning (Lesgold & Reif, 1983, p. 21). According to Gren et al. (1987), if computer technology is to have an impact on teaching and learning, teachers must be comfortable in using computers, seeing them as tools that enhance rather than interfere with their daily teaching.

No matter how good the materials are, they're useless if teachers are uncomfortable with them. But in classrooms where teachers are comfortable with computers... the materials work like gangbusters (Ploch, 1986).

In other words, as an educational tool, computers provide teachers with a means of solving many teaching problems, open new ways of developing the processes of thinking and problem solving, facilitate teaching

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and learning at all levels, and provide new possibilities for learning through active exploration.

In order for computer technology to be made effective, however, Sandoval (1984) says the present training of teachers in the use of computers should be refocused and redefined. Fullen et al. (1987), further said that there should be follow-through, ongoing assistance and training, clarification and innovation adaptation during the implementation, continuing support from the administration for the use of computer technology, and adequate software and hardware facilities should be available for the teachers. In addition, teachers should have positive attitudes towards computing.

Research studies have pointed out many reasons why instructional technology has not been successfully implemented in public schools. These reasons are: (1) lack of knowledge about the innovations on the part of the teachers, (2) a negative view held by the teacher about the instructional value (Becker et al., 1986), (3) lack of equipment and inadequate training (Office of Technology Assessment [OTA]), and (4) inappropriate training. OTA found that teachers' use of computers depends on their instructional goals, teaching approach, training, software and hardware available to them, and the instructional setting.

Conceptual Framework

In order to study factors related to the implementation of the educational technology, I have proposed the conceptual model in Figure 1.1.

The theoretical framework guiding this study is based on studies carried out

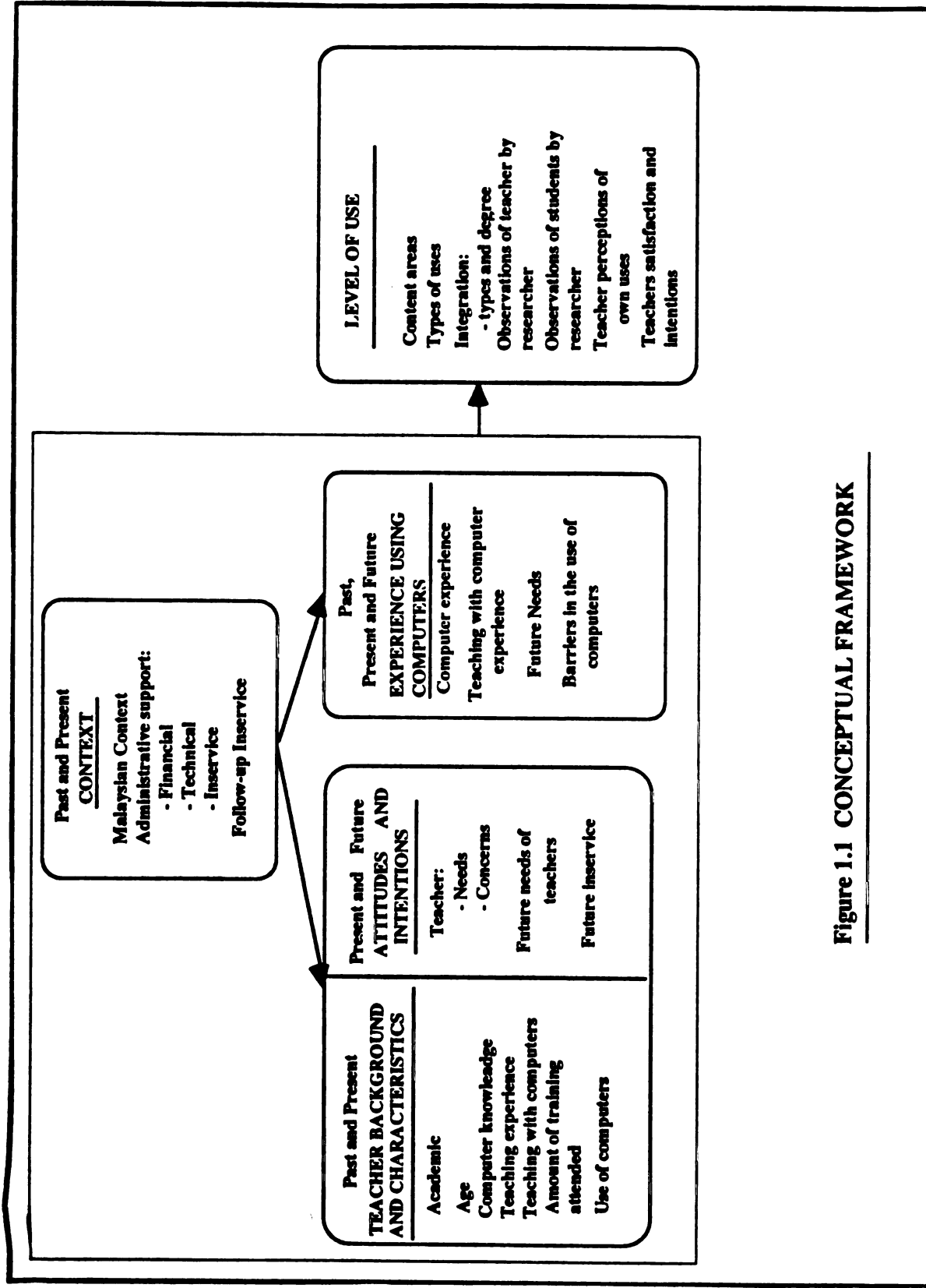


Figure 1.1 CONCEPTUAL FRAMEWORK

by Shavelson et al. (1984), Fullen et al. (1987) and OTA, which state that in order to explore whether teachers are or are not using the technology successfully, research should address the instructional practice (e.g., current practices and uses of computers), characteristics of teachers (e.g., teaching experience, computer knowledge, and attitudes) and learning context (e.g., training, classroom, school support, and facilities).

The conceptual model is composed of five classes of variables: (1) general context; (2) teacher background and characteristics; (3) teacher attitudes and intentions; 4) teachers' current practices and experience using microcomputers; and 5) dependent variables, that is level of use.

Conceptual and Operational Definitions

The following section provides the conceptual and operational definitions in this study.

General Context:

Conceptual: General context in this study is the support provided by the government to teachers and schools involved in the Computers in Education project.

Operational: The teachers' responses to questions regarding the kinds of support that are being provided by the Malaysian government, either financial, technical or training and follow-up in-service, and the facilities available (i.e., hardware and software).

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Teacher background characteristics:

Conceptual: The whole of a teacher's study, experience and individual or distinctive qualities that distinguishes one teacher from another (e.g., level of education, age, teaching experience, experience teaching with computers, and computer knowledge such as the use of BASIC programming language).

Operational: The assessment of CIE teachers' age, level of education, computer experience, teaching experience in using the computer, and computer knowledge such as the use of BASIC programming language, as well as the approaches that they used.

Attitudes and Intentions:

Conceptual: Attitude in this study is defined as teacher's acting, feeling, or thinking that shows a teachers opinion towards the use of computers. Intention implies what teacher's had in mind for their needs, concerns or future plans to use computers in their practice.

Operational : Attitudes-- The teachers' responses to negative and positive statements towards the use of computers. Teachers are expected to rate each statement on a scale. Intentions--teachers' present needs, concerns regarding the use of computers and their future needs and in-service program.

Experience Using Computers:

Conceptual: All the possible ways in which teachers experience utilizing computers that can help teachers enhance their teaching and

students enhance their learning including both computer assisted instruction [microcomputers use that guides students through some type of pre-programmed activities], as well as microcomputer application such as word processing spreadsheets and graphics).

Operational: Teachers' responses to questions regarding their experience in using computer, perception of own uses, types of uses, content areas, integration into subject matters and future uses and needs.

Level Of Use:

Conceptual: The degree a teacher uses computer software such as application software like word processing, spelling checker, databases, graphing and painting; programming software such as basic, PASCAL, logo; and other instructional software such as tutorial, drill and practice, and games and simulations software.

Operational: Level of use consists of dependent variables including varieties of indicators. Teachers' responses include how frequently they had used the different types of software which include applications, instructional, programming and games.

Background of This Study

In the early 1990s, the use of computers in education was given increasingly high priority in secondary schools in Malaysia. The Ministry of Education (MOE) established a special program called "Computers in Education (CIE)," starting with 120 teachers from 60 schools. Each of the CIE project schools was equipped with computers and software. By 1991 the

CIE teachers were given training in computer education. In the training sessions, computer technology was introduced to teachers, and they were taught how to use and incorporate computer technology in their classroom instruction. Given this hardware, software and training, the government expected teachers to use computers in their classroom instruction.

Given the above background, I wonder if these teachers make effective use of this technology. If no, then what are the factors are contributing to teachers using the computer technology ineffectively. A number of studies have stated that teachers do not apply immediately to classroom practice the skill they acquired in their training; and, even if they tried, it was not successful. For example, cited from the work of Joyce and Showers (1982), ... quite often teachers who attend training sessions and then try to apply what they have learned report that it does not work" (pg. 6). Joyce and Showers further said,

...the development of skill through training does not ensure transfer; relatively few teachers, having obtained skill in a new approach, will then transfer that skill into their active repertoire and use the new approach regularly and sensibly unless they receive additional information. ... the conditions of the classroom are different from training situations; one cannot simply walk from the training sessions into classroom with the skill completely ready for use... (pg. 5).

In other words, what Joyce and Showers want to emphasize that there are other components or factors that are extremely important if a skill is to be obtained and transferred into the classroom practice. Research shows that, such as when given the machines, software and training teachers do not use them effectively, then there may be other critical factors that need to be considered.

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Rationale for The Study

The Malaysian government has planned substantial expansion beyond the initial 60 schools and 120 teachers and some of these plans are already being implemented. Very little is known about the success of the initial phase of installing the equipment and conducting the training programs. In other words, I am trying to find out whether teachers are really benefiting in ways that affect education. The Malaysian government is implementing more of the project at different phases, but we really don't know enough yet about the success of the phase implemented earlier, and that is why I am doing this research study. I think it is very important to study the success or failure of teachers' current practices of computer usage in their classroom instruction and how the administrative system is organized to support the innovation at the initial phase before continuing more of the project at higher phases .

Findings from this research study will help recommend future needs for teachers to use computer technology effectively and efficiently in their classroom instruction.

Limitations of the Study

1. The scope of this study was limited to one Malaysian state.
2. The people involved were very small number. It would be a lot easier to deal with this data if I had more people, and this will give stability in analyzing the data.

Definition of Terms

The relevant terms used in this study are defined as follows.

Applications software includes programs designed for a well-defined, but possibly very general, purpose (e.g., word-processing, database management system).

Computers refer to both the hardware and software that make possible a particular usage. It also means the microcomputer which can be used to run stand-alone software packages or can be hooked up to a mainframe through the modem for network communication purposes.

Computer literacy refers to a beginning awareness of what a computer system is and the components that make it up, the languages that are used with computers, their basic operation, their impact on our society in general and on particular occupations, both now and in the near future, and an introduction to actual programming of a typical computer.

CIE-Computers in education teachers refer to those who were selected to go through the CIE training programs.

Computer uses include all the possible ways in which computers can be utilized to help teachers enhance their teaching and students enhance their learning (including both computers assisted instruction [microcomputers use that guides students through some type of pre-programmed activities], as well as microcomputer application such as word processing spreadsheets and graphics).

Implementation refers to the process of putting into practice an idea, program, or set of activities new to the people attempting or expected to change.

Instructional delivery includes teachers' use of the computer as a tool to support presentation of instruction. Teachers may deliver the instruction but use the computer as a tool, tutor or tutee.

Instructional software--often called courseware--is the term applied to computer programs designed to present material about or provide practice with some specific topic or subject area (e.g., drill and practice; instructional games; tutorials; simulations; databases; and special languages such as logo).

In-service training is used broadly to include any professional development after one's initial training period.

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CHAPTER TWO

REVIEW OF THE LITERATURE

Introduction

The previous chapter presented, in general, a brief review of the literature on some factors concerning with teachers using computers in their classrooms. I hypothesize that many of the same factors and problems are related to what is going in Malaysia's educational system. Therefore, I feel that Malaysia may need to focus on these variables to find out what factors are associated with teachers using computer educational technology successfully in their classroom instruction.

This chapter presents a review of literature that examines the combined influence of factors concerning teachers using computers in their teaching. The factors are background characteristics (i.e., teachers' computers knowledge, teaching experience); context (i.e., administrative support, training program, hardware and software, school and laboratory environment); attitudes toward the use of microcomputers (i.e., teachers' attitudes, concerns); and experience using microcomputers by the teachers. Included in this review are the implications for this study.

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General Context

Administrative Support

Many studies have found that encouragement and support from school administrators and principals is vitally important in the implementation of computer use (Carmicheal, Burnett, Higginson, Moore, & Pollard, 1985; Cox, Rhodes, & Hall, 1988; Fullen et al., 1987). Help from principals is especially necessary in providing facilities for training, the purchase of hardware and software, and the rearrangement of timetables and other organizational measures (Akker, Paul & Tjeerd, 1992). Negative attitudes and poor perceptions that technology can enhance teaching and learning by the administrator will lead to little or no support. Without adequate administrative support and follow-through, the effectiveness of computers will be severely limited (Sherry, 1990).

Fullen & Pomfret (1977), found out the way principals accommodate teachers for the time they need to learn about microcomputers is important. Principals' support has great influence on teachers' effective use of microcomputers in the classroom. To fully support the teachers, principals should know the basic things about computers, hardware, and software themselves.

Principals can no longer remain uninformed. Although they need not be computer experts, all principals need some knowledge of hardware, software, computer assisted instruction (CAI), and micro-based administrative operation (Coffin & Gregory, 1985, p. 1). Coffin and Gregory also found that one of the greatest obstacles hampering teaching

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effectiveness was a lack of the principal's support for the use of technology in the classroom.

While teachers are working hard to learn how to use computers effectively in the classroom, many principals have failed to keep up with this knowledge and do not offer the support teachers need to secure essential funding (p. 4).

In addition to support, good communication and a relationship between administrators and teachers are prime users of computers for teaching are important in order to fill the necessary needs of teachers and students. According to Sheingold et al. (1981), numerous studies have documented a lack of "user" participation in system requirement specification, software development, and organizational role. This has contributed to low utilization, rejection, or misuse of computers by teachers.

During the 1980s, higher education experienced what can be characterized as a "microcomputer revolution." At this time virtually all institutions expended large sums of money to establish microcomputer laboratories for students' use (4).

The majority of the teachers surveyed indicated that teachers need more hardware access and capacity, classroom computers, graphics capability, support personnel and training, release time, departmental recognition, and curriculum assistance.

Implications of This Study. In this study I sought to find out (a) whether there was a continuing support for using microcomputers in teaching - either financial or technical, provided by the school or district in Malaysia. In knowing this information I tried to relate the different kinds of

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support available in each school or district with the variations in the ways that teachers use microcomputer in instruction; (b) what teachers' perceptions were of the need for more administrative support. Through the teachers' points of view, the kind of support services teachers would like to have available in the school or district in order to effectively use microcomputer in instruction surfaces.

Training Programs

In-service training plays an important role in technology training. In order to maximize the effectiveness of computers, teachers must be given the time and training necessary to understand how to take advantage of a computer's strengths. In addition, teachers need training in how to implement the use of the computers with their regular classroom instruction (Sherry, 1990).

From the studies of Pelgrum and Plomp (1991), the UK surveys, the research of Cox and Rhodes (1990), the IMPACT project and others, there is overwhelming evidence that the current levels of in-service provision are not achieving the goals of teachers using computers regularly in their teaching. In the United Kingdom, there have been training courses offered to teachers since the 1970s, courses which vary from two-day courses to train teachers with the technical skills of using computers to one-year, full-time, award-bearing courses to train teachers for the use and integration of computers into their curriculum. Similar research was done by Cox and Rhodes who found that the majority of teachers had received only initial awareness training with 33% receiving an additional short-service course.

Only 3% of the teachers had attended a longer, award-bearing course. Yet the research of Cox and Rhodes, the UK surveys, and others showed that courses were inadequate to enable teachers to use computers competently on a regular basis in the classroom. The results suggest that even though many teachers may have received some training, this was not enough to help the majority of teachers integrate computers into their classroom practice.

The IMPACT project also found that in the training, very little time was spent by the course tutors in showing teachers how they might use the software in the curriculum. The majority of these teachers were not using computers and said that they still needed more training before they could use them in their lessons. As can be seen from these results and from other research findings, it is clear that many in-service courses were not effective in training teachers to use computers in education.

Well-trained teachers can use computers to increase students' higher-order thinking.

[Computers] can allow students to formulate hypotheses, test them, analyze results, and refine their conceptions. Moreover, they can provide the student with a record of the course of his or her investigations, permitting greater self-awareness of thinking and learning. (Lesgold & Reif, 1983, p. 21)

There is considerable discussion in the literature about lack of teacher training and the feeling of teachers' being "unprepared" to meet the challenges of classroom computer usage (Bychowski, Deborah, Van & Ralp, 1984).

Initially, teachers obtained their computer training through short workshops, seminars, and other in-service activities (Young, 1987). Most of

these activities were superficial and dealt with only the rudiments of computer literacy. Teachers felt inadequately prepared to use microcomputers in their classrooms. Although there are in-services, opportunities to study, and helpful teacher and/or computer resource personnel, these resources are still considered inadequate by the teachers.

Many teachers still feel inadequate in using computers to augment their teaching even though they have participated in computer in-service programs in the past. Some of the early computer training programs may have overemphasized the need to learn programming, or focused attention on matters that had little or no relevance to teaching (Bruce, 1990, p.32).

Barker (1986) shows that about 49% of teachers in large high schools and over 36% of teachers in small high schools are neither familiar with how the computer operates nor do they know how to use it. To fully utilize computers in teaching, teachers must be expert practitioners of the technology. Most in-service efforts are too brief and preclude any in-depth learning. The nature of the computer training that teachers receive has been criticized on the grounds that it provide only basic knowledge of the nature of computer systems. Lilie, Hannum, and Stuck (1989) describe such programs as:

...noteworthy introductory computer courses. For the most part, these courses focus on how computers work, to select appropriate software and hardware (usually from the viewpoint of the technology), and how to use well-known applications packages. They also deal to some extent with the issues raised in using computers in the schools. Occasionally, courses include an introductory programming language (p. 2).

Also, due to time constraints, teachers are typically taught only the easiest applications. Erion and Moeller (1991) found that programming, statistics, characteristics of hardware components, and topics dealing with technology and society were topics in the training program that were not strongly endorsed by superintendents, principals, teachers and students. However, approximately one-fourth of the principals and superintendents and one-third of the students felt that programming should be part of the preparation of teachers.

Browne (1991) stated that most of the in-service training programs on computers did not help teachers to transfer these computer skills from teachers training to classroom practice.

... unfortunately, transferring these skills from teacher training to classroom practice has been limited (Fawson & Smellie, 1990) and has even been identified as the weakest link of most educational programs (Freiberg, 1982)."

Traditionally, initiating change in classroom practice has been accomplished through in-service training. Unfortunately, this process has had limited success. This has resulted, in part, from many in-services simply providing knowledge to teachers and doing little to help to transfer the skills to actual classroom implementation (Boe, 1989; Copeland, 1982; Hall & Loucks, 1977; Showers, 1990). This problem has been explored by Hord, Rutherford, Huling-Austin, and Hall (1987),

One of the most common serious mistakes made by both the administrators and leaders of a change process is to presume that once an innovation has been introduced and initial training has been completed the intended users will put the innovation into practice (p. 1).

According to Donna and Donn (1991), in-service training structured to help teachers incorporate technology into classroom practice face additional problems. These workshops often focus solely on the wonders of the technology and ignore the needs of individuals involved in the change (Kinnaman, 1990). Although these in-service, have the potential to initiate large-scale changes in teacher practices without identifying teacher needs and concerns (Rossett, Gabosky & Browning, in press) and implementing strategies to ensure transfer of the technology, in-services will continually fail to reach their potential.

The research literature on teacher training and involvement emphasizes stages of concern, trainer-trainee interaction, incentive for staff development, and the role of principal as important factors to consider. The preparation needs for teachers can be expected to vary depending on teachers' stages of knowledge and interest in microcomputers. The literature on stages of concern (Hall, Wallace, & Dossett, 1973) clearly states that effective training requires an appropriate match between types of training and teacher expertise and interest.

Placing powerful technology such as computers in the hands of the teacher is not enough. Pre-service and in-service training in computer technology must become a priority if we are to have teachers who are both comfortable and competent in the use of technology in their teaching. Training teachers to use technology effectively has unique requirements that distinguish it from traditional teacher training activities. Teachers need well-equipped facilities and an environment which allows them to explore and master the computer technology. Instructors for these activities must

appreciate teachers' special concerns regarding computers (Hasselbring, 1991). Ciachelli et al. (1989) suggested in their study that teachers are concerned with the appropriately designed in-service training, specifically matched to teachers' concerns and delivered in logical progression, which may result in reducing teacher resistance to implementing computers' technology in the school.

Moreover, training should be conducted over years, not just days. Teachers should be given ongoing, front-line technical support while they are practicing what they have learned during training. Fullen et al. (1987) concluded

using microcomputer and curriculum software in the classroom [...] represent a major and difficult change in practice for most teachers, and the effective utilization will depends on follow-through, ongoing assistance and training, clarification and innovation adaptation during the implementation, in addition to the availability of easy-to-use technologies, curriculum relevant software, and introductory training.

Instructor survey results taken in the United States reported that most of the teachers (64%) have taken a computer course, but 60% find the typical in-service course unsatisfactory. And much of this training focused on learning about computers, not learning how to implement teaching with computers.

The situation is no more promising for those just entering teaching. A recent American national survey of education majors indicated that less than one-third (29%) perceived themselves as prepared to teach with computers (American Association of Colleges for Teacher Education, 1987). A survey done by Hasselbring (1991) indicated that the vast majority of those new

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teachers have had little or no computer education or training. Only one-third of all teachers in grades K-12 have had as much as 10 hours of computing training (Office of Technology Assessments, 1988). Brian Wilson (1990) in his study on teacher trainers and computer utilization, found that 68% of the teachers felt inadequate with regard to computer use in general. Although almost all teacher education programs provide some computer training for teacher candidates, many of these programs do not have adequate resources (e.g., up-to-date equipment and faculty with expertise in technology) to go beyond the basic introductory computer courses (Hasselbring, 1991). On the whole, very few resources have been expended for technology that the classroom teacher can use for personal productivity and teaching.

There is a growing consensus about the characteristics of in-service training that can increase its effectiveness (OTA, 1988): appropriate balance between lecture and (guided) practice; detailed curriculum guides and plans for the course, plus lesson-related materials and hand-outs; clear training objectives; in-service lesson linked to teachers' own instructional practice; peer interaction, including communication during hands-on activities; strategies for teaching heterogeneous group; follow-up support and guidance.

Similar findings were described by Stecher & Solorzano (1987). Their studies, examining in-service computer education programs identify several instructional practices that contribute to effectiveness. Among others are:

- 1) A cycle of mini presentations, demonstrations, and practice sessions appeared to be the most effective approach.

2) Detailed curriculum guides and lesson plans--well planned materials were a visible component of the in-service programs

3) Clear and relevant objectives--teachers needed to have a clear understanding of what they would learn and of their responsibilities

4) Lesson related materials and handouts appeared to free teachers from extensive note taking or reliance on computer manuals.

5) In-service lessons linked to instruction--teachers like specific help on preparing materials and experiences for their own students. Teachers appreciated and learned from good modeling on the part of the trainers.

6) Peer interaction during hands-on sessions was particularly effective.

7) Strategies for teaching heterogeneous classes--trainers who had ways to deal with students of differing levels of prior knowledge and anxiety were more effective.

8) The impact of training was much stronger when followed up. Typically, teachers would come back together and report on their use of the computer application in the classroom, and share experiences. All of these are needed to integrate computer usage in education.

Implications for This Study. In this study I interviewed teachers to find out (a) about the characteristics of in-service training taken by the CIE teachers, whether the in-service lesson fit or meshed to teachers' own instructional practices, what teachers felt about the training program, what other factors teachers need to know about computers in the training in order to use computer effectively and efficiently in educational instruction; (b) what

kinds of in-service program teachers thought would be valuable for them in using microcomputers in instruction, and whether teachers' perceives that they have enough training. With the above information I tried to find what educational factors affected teachers using the technology and teachers future in-service needs.

Hardware and Software

The two most vital components for learning about computer usage are hardware and software. Low quality hardware will not allow high quality software to be utilized, and a powerful machine may be wasted if effective software is not available for the purposes intended (Teacher Education Conference, 1984).

The number of installed base of computers is inadequate on two counts. First, there are insufficient numbers of machines to adequately infuse computer technology based learning across a number of content areas into the existing curriculum. Second, the computers that are found in many of the schools largely represent old technology that lacks the power necessary to implement sophisticated instruction as promised by computer technology visionaries. These less powerful computers have not allowed more sophisticated uses to be implemented (Hasselbring, 1991).

Hannafin, Dalton, and Hooper (1987), writing on the myths that keep computers out of education, said that users believe that there is still not enough hardware in schools to encourage large scale usage. In most elementary schools, for instance, the standard may be one computer per school. In such situations, teachers tend to regard computer use as extras they have to take care of in addition to other classroom duties, such as

planning lessons, preparing materials, grading papers, and attending meetings. They do not view the computer as a tool that could be used to enhance the instructional process (Novak & Knowles, 1991).

Young (1987) stated that probably the most traditionally and widely used type of software program or application is that of computer assisted instruction (CAI). The most common software involves programs that reproduce lessons for practice and drills.

Implications for This Study. In this context I studied the number and types of computer devices that were available in each school, types of software program that were available to the teachers, the quality of the current software, and what kinds of software or hardware that the teachers would like to have to enable them to use the computer technology effectively in their current or future classroom computer use. I tried to relate the availability of hardware and software to variations in the use of computers in their instruction. I also wanted to find out what beyond basic sets of hardware and software they have what needs remain.

School and Laboratory Environment

According to Papert (1987), the interaction of children, computers, teachers and their surrounding environment has great influence on learning. Teaching and learning in this context means providing the kinds of environments where children can use the computer as a tool to enhance their learning. The physical setting of computer use in schools has implications for

the instructional contexts chosen, social interaction, and student attitudes to computer technology (Moore, 1987).

Macgregor (1985) states that when teachers have more students than computers, the learning environment must be reorganized to accommodate computer usage. Thus, students are one aspect of the classroom which has been identified as having a powerful influence on teachers' instructional decisions. Differences in students' ability levels have found to greatly influence teachers' behaviors, such as the types of teaching materials they use and methods which are selected and used (Doyle, 1979, Haller 1967; Hoy 1967, 1968, 1969; Pollard, 1982).

Implications for This Study. In this context I observed the physical setting of computers used in the lab. I tried to relate how teachers reorganize the learning environment and how students were grouped to the classroom activities involving computer use.

Teachers Background Characteristics

Teachers' Computer Knowledge

In order to use an instructional tool such as the computer to achieve the goal of computers usage in their classroom, teachers must have adequate knowledge about the computer. Computer knowledge is important if a teacher is to effectively use computers to enhance teaching and learning for their students. Summers (1988), in response to an "importance for teachers" questionnaire item, found that more than 99% of teachers rated the question about computer usage "important" to application of computer usage, with

more than 50% rating it "very important." Summers also found that teachers who do have computer knowledge have a very vague knowledge about computer usage.

Where any knowledge of computer behavior exists, it is likely to be limited to a rather vague conception of the machine as something which stores information (p.188).

Wilson (1990), in a study on the preparedness of teacher trainees for computer utilization, found out that even though the majority of teachers studied expressed positive feelings about computers, but 68% still felt inadequate with regard to computer usage.

Bychowski, Deborah, Van and Ralp (1984), in their study on current classroom computer usage and computer knowledge, show that most of the teachers surveyed did not feel that they possessed adequate knowledge of the aspects of computer technology which are very necessary to effectively use computers in the classroom .

Budin (1991) states that a meaningful approach to computer education must emphasize accurate teaching as well as computing. Teachers must be educated in order to be experts in computers education to make meaningful curricular decisions for using them in each of their educational situations.

Implications for This Study. In this study I researched what Computers in Education (CIE) teachers think about their current computer knowledge. Did teachers think that they possessed adequate knowledge to effectively use computers in classroom instructions. If they did possess

adequate computer knowledge, would it be reflected in their current practices and computers use in their classrooms. I would like find out whether teachers with more knowledge of computers used computers in classroom instruction differently from less knowledgeable teachers.

Teaching Experience

It is plausible to expect that teachers who have more teaching experience in the use of microcomputers would use microcomputer-based instruction somewhat differently than teachers with less teaching experience in using microcomputers. Shavelson (1984) wanted to find out to what extents the data bore out this prediction. From his data, he found out that the teachers in his sample, regardless of instructional use, had considerable experience with computers. The teachers had, on average, used approximately 25 different courseware packages during the school year. These teachers had applied computers usage outside their work in a number of different ways (e.g., word processing, data analysis), used several different types of hardware, and wrote in one or more computer language (usually BASIC and another language such as Pascal). Approximately 70% of the teachers had taught sessions for staff development, and 85% had served as a school resource person for microcomputer usage. The results of Shavelson's analysis showed that instructional usage is unrelated to teachers' experience in using microcomputers and in teaching other teachers about them.

In contrast, Sheingold's (1990) study showed that there were patterns of instructional use in relation to teachers experience in teaching with microcomputers. Her findings indicated that teachers with less than two

years experience in teaching with computers used drill-and-practice more frequently and less word processor and databases in comparison to teachers who had more than five year's experience. Her results imply that there is a difference in instructional use between teachers who had less than two years' experience and teachers who had more than five years' experience.

Implications for This Study. In this study I wanted to find out the different ways the teachers use microcomputers in relation to their personal background and characteristics, such as the amount of training they had attended and experience in teaching with microcomputers.

Attitudes and Concerns

Teachers' Attitudes

The success of any new educational program on computer technology depends strongly upon the support and attitudes of teachers involved (Woodrow, 1991). For example, if teachers regard computers negatively or with suspicions, or believe that a new program (as it is being introduced) will not work successfully, the educational utilization of computers will be limited (Woodrow, 1991). Randhawa and Hunt (1984) found that if teachers believed or perceived proposed computer programs as fulfilling neither their own or their students' needs, they are likely to strongly resist not only all attempts to introduce such courses and technology into their schools, but also all offers or suggestions for retraining them to meet the challenges that the introduction of such programs would present.

As in the USA, Malaysia school system is introducing computers into classrooms in increasing numbers. The ultimate decision as to whether or not they will be used functionally is generally left to the individual teacher (U.S. Congress, Office of Technology Assessment, 1988). According to Anderson (1984),

...the attitude of teachers to computers is enmeshed with how they are used, which in turn relates to cognitive and affective outcomes of students (p. 93).

Positive teacher attitudes towards computing are critical if computers are to be effectively integrated into the elementary and secondary curriculum.

Today, the bank of information about teachers' computer attitudes seems to be rapidly increasing. Much research finds that in general teachers, students and others have been found to have positive attitudes toward computers. Dickey and Kherlopian (1987) reported that most teachers believe that the amount of computer experience has a positive effect on attitude toward computers. Hawkins (1984) indicated that negative reactions to computer experience come mainly from females. By contrast, Vermette, Orr, and Hall (1986) did not find significant differences between male and female teachers who responded to an attitude inventory. Becker (1985) reported that attitudes towards computers were not related to sex, age, or job level relationships among cooperative extension workers, but that these attitudes were related to perceptions of math ability.

General teacher attitude plays an important role in the educational process (Muller, Husband, Christou & Sun, 1991). Specifically, attitudes

toward the use of computers need to be evaluated to successfully implement technological advancements into the classroom (Stevens, 1982). The idea that attitude toward technology affects implementation success not only makes intuitive sense but appears repeatedly in the literature (Choo & Cheung, 1990-91). A positive attitude has been shown in several studies to correlate to successful implementation of computer usage.

Implications for This Study. In this study I studied the statements that reflect teacher attitudes toward the use of computer. Teachers rated these attitudes' statements by using a six point scale provided in the questionnaire. I tried to relate the attitudes of teachers concerning with uses of computers in classroom instruction. I also wanted to find out teacher's goals for using the computers.

Teachers' Concerns

There is considerable discussion in the literature about in-service training that does not take into account the concerns of the participants. Research suggests that much of the in-service activity is not optimally successful and useful because designers are not aware of, and do not consider, the existing developmental stage of the participants' attitudes, concerns, understandings and skills in relation to the innovation (Loucks & Hall, 1977).

To find out teachers' concerns about educational innovations, Fuller developed a Stages of Concern Model. He made use of this model as a method of measuring and analyzing concerns of teachers about educational

innovations. He concentrated on pre-service, teacher education students. He concluded that teachers pass through a sequence of stages of concern. Beginning teacher trainees may have concerns that are completely unrelated to teaching. They then progress to being concerned about themselves in relation to teaching, but not yet concerned about subject matter and/or students. Next, teachers become concerned about the task or content matters. As they accumulate experience, teachers eventually express concerns about the impact on their students of what they are teaching.

Hall et al. (1979) on the other hand looked at the effect of educational innovations on teachers and administrators in schools. He added two more factors in the Stages of Concern model that emphasize assessment of teacher concerns about innovations (such as the introduction of computers into classrooms). Applied to the introduction of computers into the curriculum, the stages in Hall's Stages of Concern taxonomy of reaction to innovations can be described as the following.

Stage (1) Awareness --coming into contact with computers and educational software

Stage (2) Information --gathering facts about computers in the classroom

Stage (3) Personal --concern with the impact of computers on self.

Stage (4) Management --using computers in the classroom

Stage (5) Consequence --concern about the effect of computers on students and subject.

Stage (6) Collaboration --interacting with other teachers using computers

Stage (7) Refocussing --refining classroom use of computers.

He assumed that if the content of a training program is related to the level of concern of the learner then there will be change in both the levels of concern and the attitude toward the innovation.

Wedman (1986) and Jones (1987) used the Stages of Concern questionnaire to measure the concerns of teachers at the beginning and the end of computing in-service course. Both report a high intensity of the lower level of concerns, Stages 1 (Awareness), 2 (Information) and 3 (Personal) at the beginning of the course; at the end an increase in the higher level concerns of Stages 5 (Consequence) and 6 (Collaboration); but little change in the lower concerns. Wedman noted the unexpectedly low level of management concerns in both the pre- and post-measurements. He thought this might be due to the nature of the in-service itself, which did not involve participants in implementing computing in their classrooms, or because there was not sufficient time during the course for the problems of implementation to become apparent to the teachers.

In another study, Wedman measured teachers' concerns in relation to some different aspects of educational computing, in particular word processing, computer assisted instruction, computer managed instruction and interactive video. From the results of this study, Wedman hypothesizes that teachers see educational computing as a collection of several different innovations rather than as a single entity. This perception could hinder the effective integration of computing throughout the school curriculum, as teachers will think of computing as consisting of several small pieces rather than as one whole. This could lead, for example, to word processing being

thought to fit only into a particular subject at a certain level, rather than being a general purpose tool for all appropriate levels and subjects.

Implications for This Study. In this context, I wish to find out what teachers concerns are at present and whether the activities in the in-service training given by the organizer considered the existing developmental stage of the participants' concerns, understandings, and skills in relation to the use of computers.

Experience Using Microcomputers

Uses of Microcomputers

Teachers play an essential role in the implementation of instructional innovations such as microcomputers and their applications.

Educators and educational researchers consistently cite one factor as central to the full development of technology's use in the schools--the classroom teacher (OTA, 1988, p. 87). According to Roahrig (1984), teaching and learning are essential human behaviors--not to be replaced by technology. If planned and used widely to supplement traditional remediation and other behavior, learning can be improved quantitatively and qualitatively. Meister et al. (1984) state the following.

The goal of computers use in schools not simply to maintain education but to improve it. And the key to improving education, indeed the key to great education, is teaching in all its form. Successful learning in school, whether individualized or in groups, depends on the teacher (p .9).

There are those who say a computer is a high technology tool and a problem solving tool. Most agree that the computer can be a useful tool, but

disagree on how it is to be used. Teachers can use computers in several different ways. Computers can reinforce and amplify positive aspects of education, but there is also a negative side. Smith (1986) believes that "computers can make many of the things we already do well infinitely better, just as they can make the things we already do badly in schools even worse".

Betza's (1986) findings indicated that computer usage can be categorized into tool, tutor, and tutee functions. The tool function includes applications such as word processing, data bases, and spreadsheets that help perform a task. The tutor function includes using the computer to present information to students, evaluate students' performance, give feedback and keep students' records. The tutee function involves the student instructing the computer on what to do through programming or hardware designs.

Cory (1991) states that although word processor, database management, and spreadsheet software were available, they were rarely used in schools. At the elementary school level, computers were primarily used for drill and practice, usually in math. At the high school level, the primary use of the computers was to teach students BASIC programming, so software was unimportant.

Use of computer is often affected by factors internal as well as external to the teacher. External influences include grade level (Becker, 1986a, 1986b; Folliart & Lemlech, 1989; Wiske & Zodhiates, 1987) and student composition, that is, ability levels and minority students' representation (Becker, 1986a, 1986b; Winkler & Shavelson, 1983). Computer use in elementary classrooms, as well as classrooms with low ability and high minority enrollments, most often occurs as a drill and practice activity

designed to reinforce basic academic skills. Internal factors include teachers' knowledge and understanding of computer software and their personal beliefs about the computer (Winkler & Shavelson, 1983; Wiske & Zodhiates, 1987).

The problem of inadequate hardware and software is compounded by not so friendly user software. Hanafin et al. (1987) advocate easy-to-use authoring systems with "pull-down" menus and integrated support that would enable educators to gain routine, automatic comfort with computer uses similar to driving an automobile.

Bruder (1989) reported that it has been estimated that less than 15% of the teachers in the nation (USA) use computers. Erion and Moeller (1991) found that about 85% of the teachers used computers primarily for word processing while 48% reported keeping grades on the computer. Eighty-two percent of the computer users used instructional software.

Implications for This Study. In the context of computer usage I want to find out teachers' perceptions of their experience in using the computers, the teachers' future needs, and goals and objectives in using computer in their teaching. I tried to relate teacher computer experience to the ways they used computers in their teaching.

Teachers' Practices

According to Sheingold and Hardley (1990), as teachers gained more experience they used more applications. Teachers with less than two years' experience used an average of 10.8 applications, while those with nine years

or more averaged 17.1 usage. Similarly, as teachers gained more experience, they became more comfortable with computers. Teachers with different amounts of experience use computers frequently. Specifically, the percentage of teachers used three approaches-- students creating their own products, exploring instructional computer program on their own, and teachers explaining an idea or skill- increase steadily from two to five years of computer experience.

In contrast, the percentage of teachers who frequently used the computer for enrichment, remediation, and drill usage declined slowly with years of experience.

Implications for This Study. In the context of computer usage and teacher's practices, I studied the types of software used, what software was frequently used by the teachers, in what content areas was computer being used, the degree of integration of computer used with the rest of the instruction in the curriculum, goals and objectives in using computer in their teaching, teacher's teaching strategies and grouping principles, and the classroom computer activities. From the research information which was obtained from the interviews and classroom observation, I studied the variations in the ways teachers' current teaching practices. I studied the factors that influence teachers' used of computers and teachers' future educational needs that are necessary to help them in using computers in their classroom instruction.

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Summary of the Literature Review

Based on the review of literature, I have identified several important factors that associated with teachers using educational computer technology effectively in the classroom instructions that are related to the model. This is the summary of those I perceived as important factors.

- 1. In terms of context--full support from the principal and support from the organizer such as on-going training that is adapted to teachers needs, concerns, and in-service training that linked to teachers' own instructional practice, and follow-up guidance can increase the effectiveness of teaching with microcomputers in the classroom.**
- 2. Providing up-to-date and enough machines and high quality software could allow more sophisticated uses of the computers by teachers in their classroom.**
- 3. Providing in-service training that meshes with the level of concerns of the participants will make the in-service very successful, useful and as the result teachers use microcomputers more effectively in their classroom instruction.**
- 4. Including more hands-on experience in the in-service sessions and providing more time for teachers to learn on the use of computers that are closely related to their practices in their classroom allows the transferring of skills that are learned in the training to the classroom.**
- 5. In terms of background characteristics--having adequate computer knowledge, and experiences in teaching with**

computers does affect the way teachers use microcomputers in the classroom instruction.

6. In terms of attitudes--having positive attitudes toward the use of microcomputers greatly affect the way teachers use microcomputers in teaching.
7. In terms of experience using microcomputers--the way teachers use the computers in teaching are greatly affected by their internal factors such as their knowledge and understanding of computer software, and external factors such as students' composition and ability level.

CHAPTER THREE

DESIGN OF THE STUDY

Introduction

In order to understand why teachers do or do not use computer technology effectively, I examined five different classes of variables (general context, teacher background characteristics, attitudes and concerns, experience using microcomputers, and level of use of microcomputers). The last class of variable is the dependent variables for this study.

A number of researchers suggest that some ways are better than others of looking at the effectiveness of the use of the computers as it relates to education. They suggest that the most appropriate research strategy needed to capture the essence of a dynamic process such as the implementation of technology in education is to use both quantitative and qualitative methods (Mudd, & Wilson, 1987), descriptive data (Berger & Luckman, 1967) gathered from observations (Becker & Geer 1957; Spradley, 1980), and interviews (Spradley, 1979) by someone outside of the school district (Merton, 1972). According to Mudd and Wilson (1987) and Macgregor (1985), both qualitative and quantitative research designs are

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needed to provide information about the process related to the use of computers in the teaching and the learning environment. Qualitative and quantitative research of the issues discussed is needed to develop a valid, unbiased representation of information. In this study both qualitative and quantitative methods were used to collect the data.

This research studies how computer-assisted teaching and learning environments affect the cognitive and social process in the classroom. Qualitative data were gathered from in-depth interviews, informal interviews with teachers, and teachers' written responses to open-ended questionnaires. Quantitative data were also obtained from interviews, questionnaires, and classroom observation checklists. According to Hopkins (1976), checklists provide a way for a recorder to "keep up" with what is happening. In addition the checklist avoids requiring the observer to make considerable judgment while performing the observation. The list assures that the observer will give attention to important facts while avoiding unessential aspects. As stated by McCracken (p. 28), data collected from observation allows for a deeper understanding of the classroom social processes and can yield data that are beyond the conscious understanding or implicit grasp of even the best intended respondent.

The remaining sections of this chapter contain the setting of the study research questions, research hypotheses, and the context in which computers

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are being introduced into schools in Malaysia. Sample selection, research instruments, data collection, and data analysis procedures were also studied.

Research Questions and Hypotheses

In this study, the research questions and hypotheses focused on four classes of variables: (1) general context, (2) teacher background characteristics, (3) teacher attitudes and concerns, and (4) Experience using computers in education. The purpose was to investigate how these factors are associated with teachers' level of use of computer technology in Malaysian schools, more specifically, to find out how the factors associate with teachers' utilization of computer technology in education.

Broad Question

What is the relationship of the four classes of variables to the level of use?

Specific Questions

More specifically, what are teachers' influences of each of the following on the ways they use computers. There are a number of hypotheses that are interrelated with the different factors and also with the dependent variables.

I) General Context

- (a) What computer hardware and software are currently provided for the teachers?
- (b) Do the CIE teachers have adequate computer training ?

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- (c) How relevant to using computers in education was the computer training that the teachers received?
- (d) What level of support is provided for the CIE teachers?
- (e) Are teachers main concerns and needs for computer technology being provided?
- (f) To what degree is the continuing support being provided?

The tentative hypotheses related to context are:

- (a) The amount of training is negatively related to the barriers' teacher faced when using the computers.
- (b) The amount of training teachers had is positively related to the degree of computer integration in their subject matters.

The tentative hypotheses related to dependent variables are:

- (a) The support provided for a teacher is positively related to the level of use of computers.
- (b) The training to which is adapted to teacher's concerns and needs is positively related to degree of current computer usage.

II) Teacher background characteristics

- (a) How much prior knowledge of computers do these teachers have?
- (b) What other background factors and characteristics are required for teachers to use computers in their teaching?
- (c) What is the impact of teachers' computer background on methods that teachers use in their instruction?
- (d) How well are CIE teachers prepared to use computers in their classroom ?

- (e) How adequate do teachers feel with the use of computers in their classroom ?

The tentative hypotheses that are related to background characteristics are:

- (a) Teacher's teaching experience is positively related to their concerns on the use of computers.
- (b) Teacher's computer knowledge is positively related to the amount of training they had attended.
- (c) Teacher's age is negatively related to their interest towards the use of computers.
- (d) Teacher's teaching experience is negatively related to their interest towards the use of computers.

The tentative hypotheses related to dependent variables are:

- (a) Teacher's computer knowledge is positively related to the degree of current computer usage.
- (b) The amount of training teachers had is positively related to the degree of current computer use.

III) Attitudes and concerns

- (a) What are teachers' attitudes toward computing?
- (b) Are needs such as financial besides training and equipment are provided for teachers to effectively use the computers in instruction?
- (c) What are teachers' concerns when using computers in the classroom instruction?

The tentative hypotheses related to attitudes and concerns are:

- (a) Teacher's attitude towards the use of computers is positively related to the amount of staff development that teachers had.

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- (b) The more computer knowledge teachers' had the more computer needs they will discover.

The tentative hypotheses related to the dependent variables are:

- (a) Teacher's computer needs is positively related to the degree of current computer usage.
- (b) Teacher's attitude is positively related to level of computer usage.
- (c) Teacher's attitude is positively related to the level of computer use.

IV) Experience using microcomputers

- (a) To what degree do teachers integrate computers with their subject matters?
- (b) To what aspects do their experiences and need seem to be affect the utilization of computers?
- (c) What are their past and present perceptions of the uses of computers?
- (d) What are their future visions in the use of computers in their teaching?
- (e) What limitations might stand in the way of a more comprehensive utilization of the computers?
- (f) What conditions are most favorable for teachers to effectively use computers in instruction?

The tentative hypotheses related to experience using computers are:

- (a) Teacher's who use a computer at home will integrate the computer more with their subject matter than teachers who do not use a computer at home.
- (b) Teacher's attitude towards the use of computers is positively related to the degree of integration of computers in subjects taught.

- (c) **Teacher's experience with computer is positively related to the integration of computers in subjects taught.**
- (d) **Teacher's experience teaching with computers is positively related to the level of use of computers.**

The tentative hypothesis related to the dependent variables is:

- (a) **Teacher's experience is positively related to the level of use of computers.**

Setting of the study

The Malaysian National Scene

The Federation of Malaysia was formed in 1963; it links Peninsular Malaysia and East Malaysia (the states of Sabah and Sarawak on the island formerly named Borneo), which together contain approximately 17.8 million people. The educational system in Malaysia is centrally administered by the government. Education has commanded a high national priority since the country's independence in 1957. Education plays a significant role in the social, political and economic development of the country. The Curriculum Development Centre of the Ministry of Education is responsible for formulating the primary and secondary school curriculum.

Malaysia is a multiracial nation with various ethnic groups, namely the Malays, Chinese and the Indians predominantly found in the peninsular section. Schools in Malaysia follow a 6:5:2 pattern: six years of education in primary school, five years of education in secondary school, and two years of education in secondary school pre-university programs. Ninety-eight percent of the children are enrolled in primary education. Promotion to the secondary school is automatic. During secondary school years, about eight to

ten percent of the students drop-out. Bahasa Melayu is the national language, while English is the second language; however, children have the opportunity to enter the primary-school with their ethnic languages used as the medium of instruction. After 13 years of the formal education, the qualified students will be able to pursue university-education. There are twenty-nine teachers colleges and seven local universities that produce the teachers in the schools.

Context in which Computers Are Being Introduced into Schools in Malaysia

Computers were introduced in Malaysia in the early 1980s. Their introduction was led by private schools and the secretarial college which introduced computer-related courses in order to be certified. This influenced parents of children at government schools, who asked for similar courses (Ng, 1989).

In 1986 the Ministry of Education established a Computer Literacy Pilot Project (CLPP) in 20 selected secondary schools. This project enlisted fourth year students (16 year-olds), irrespective of whether they had shown any preference for computing. In this project teachers were expected to cover four basic criteria: 1) What is a computer? 2) What can a computer do? 3) How can we direct the computer to do something (through Logo and BASIC)? and 4) How does a computer effect lives and society? (Shahul & Ramli, 1987).

The Ministry also issued guidelines to encourage the formation of school computer clubs which in some cases developed spontaneously in the

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early 1980s. Ng (1989) said that approximately 500 computer clubs, each with one or more computers, were established in this period of 1981-1987. These clubs were predominantly in urban areas and were established for the purpose of increasing students' understanding of potential of computer usage and to encourage those who wanted to pursue a career in that field. The Ministry issued guidelines to encourage the formation of school computer clubs. These guidelines suggested that clubs might try to cover BASIC, Logo, word-processing, database management, spreadsheets, Computer Aided Learning (CAL) and games. Most of the computer clubs could not cover the wide range of suggested activities. Instead, computer programming dominated the activities at first, and only recently have applications such as word processing come into use. Learning to program in BASIC language was and is very popular, probably because this was the first programming language teachers taught themselves to use. Logo was rarely used. Computer-assisted-learning and software knowledge is lacking and teachers themselves have not been trained to use various software in their teaching, despite the Ministry's suggestions to use examples from all subjects to avoid a mathematical bias. A Research Center of Science and Mathematics (RECSAM) survey (Pak & Punyapinyophol, 1988) indicated that few students could learn about computers other than through these clubs. The purpose of the club was to provide computer awareness for all students. The activities for each club vary from school to school. The clubs also differ widely in equipment and support. Club fees provided the main source for buying computers, thus membership was and is restricted to those who can afford the fees.

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The RECSAM survey showed that there were only a few teachers who knew much about how to use computers and that these teachers had usually acquired their knowledge informally. Despite this setback, principals, teachers in charge of computer clubs, and their colleagues in general were favorably disposed towards introducing computers into education. The computer clubs are recognized as an official extracurricular activity by the Ministry of Malaysia.

Projects Related to the Use of Computers in Schools

An informal interview was conducted with the Malaysian Institute of Microelectronics System (MIMOS) officers who are responsible for the planning of most of the educational projects. The purpose of the interview was to get insight for their plan for the CIE project and with other projects related to the use of computers in the schools. The interview with the CIE planner was conducted at MIMOS office and lasted for about two hours.

I learned that the collaboration between MOE-MIMOS has resulted in four major educational projects that are in the process of implementation.

The four projects are :

- 1) Computer-In-Education (CIE) Project
- 2) ComIL (Computer Integrated Learning System) project
- 3) Computer-as-a-Tool project
- 4) JARING (Joint Advanced/Academic Research Integrated Networking) project

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Computers in Education (CIE) Project

The Computers in Education (CIE) project was launched early in 1991. The CIE is the most mature project in comparison to the other three projects. CIE is a part of a school project administered by the Ministry of Education (MOE-MIMOS), Malaysia. The project involves 60 secondary schools in rural areas throughout the country (Mat Akhir Hj. Abdullah 1991), whereas computer clubs are primarily found in urban schools. In rural schools, there were no computers nor computer clubs, and computers are being introduced for the first time through CIE project. The primary purpose of selecting schools from rural areas is to give these schools' teachers and students the opportunity to use computers to aid in teaching and learning.

With the help from the Development and Supply Division, Ministry of Education, Development and Planning Unit, State Education Department, and District Education Office, each of the CIE project schools were equipped with a computer room, each consisting of 21 (ATOM-1, IBM compatible) with color monitors (CGA/EGA) computers, chairs, tables and etc. One of these (80386-SX, 16 Mhz, 4 MB RAM, 120 MB hard disk) serves as a server connected to the rest (ATOM-1, no hard disk) via D-Link/LANSmart, a local area network software. Other software installed includes Word Perfect 5.1, DrawPerfect 1.1, DBase 4.1, Lotus 1-2-3 Version 2.3, Power BASIC, EJA_BMTeks, DR-DOS 6.0. In addition to the software, two sets of printers, an electronic imaging system (projection panel), overhead projector, screen, and mouse are also provided. Providing all schools with the same type of hardware and software will lead in the near future to a certain

standardization of hardware and software. The MOE will extend the CIE project to 1996 and now the CIE projects is in its third phase of its implementation.

Teachers. Teachers who were selected were given a special course in training on computers. These teachers are known as CIE teachers and were selected based on their interest in computers and number of years experience in teaching. The teachers involved come from diverse backgrounds. Some may have computer backgrounds, and some may have no knowledge of computers at all. The first group (initial phase) of CIE teachers was trained in May 1990 and the second group was trained in September 1990 at the National Public Administrative Institution. In each phase additional teachers were identified and were trained. The training was given by CIE resource persons who had received special courses in "Computers in Education" sponsored by the Institute of Aminudin Baki for 3 months. In addition, all the CIE teachers involved, resource persons, and CIE state coordinators had attended an extension Computer in Education courses for 6 months. The training was held at the Asian and Pacific Development Center, Kuala Lumpur, in November and December 1991.

Students. The initial phase involved only the first-year secondary students. The second phase was the follow-up of the first year to the second year. Now the CIE program is in its third phase that involved first- and second-year secondary students (Form One and two students ages 13-15 years). The computer classes are taught two times a week for 40 minutes.

The CIE project will be extended for the total of five years. The government expectation is that by the year 1996, all students in secondary schools will have at least a basic understanding of computers and their uses, with some learning of skills needed to function in an increasingly computer-oriented society.

The CIE project is still continuing now and the government is also starting some other projects such as ComIL, Computer-as-a Toll and JARING that are presented next.

ComIL (Computer Integrated Learning System) Project -- Authoring Software

The collaboration between the Educational Ministry and Malaysian Institute of Microelectronics System (MIMOS) has resulted in an authoring tool (ComIL).

The system comprises the main component -- an authoring tool, a database management system, and a networking application module. ComIL is a menu driven application with a graphical user interface (GUI). It is developed using the C programming language. It uses Bahasa Melayu terminologies at the prompt.

The system also includes the interface manager editor (IME). Besides the basic commands such as create, open, and save for manipulating folders and pages, IME provides separate editor programs for audio, graphics, and text objects. All these can be utilized for courseware design. In addition ComIL is also designed to automate administrative work, facilitate research

and development, monitor students performance and provide access-control to software. The software developer claimed that courseware created with ComIL program empowers students to learn at their own pace and with minimum intervention from their instructors.

In the pilot phase the machines provided for CIE project were installed with ComIL software. The Ministry expected ComIL to be used by teachers in the CIE program. With ComIL teachers are able to shape a kind of courseware appropriate to the students level and interest.

For the pilot project, 120 teachers participated in the training program. It was stated that ComIL is currently being used in the CIE project involving 60 schools nationwide (New Straits Times, 1993).

Computer-as-a-Tool project

Computer-as-a Tool project was launched on March 1994. In this project, Computer-as-a-Tool was defined as any form of computer usage that enhanced teachers' teaching and students' learning, and to increase students academic performance (PPBK report, 1994). The pilot phase of this project involved fifteen primary schools in rural areas of the state of Selangor. These schools were equipped with computer rooms, each consisting of 21 (386SX- IBM compatible) computers with color monitors, two printers, chairs, tables, etc. Some schools have carpeted floors and air-conditioning. The computers are not connected as networks; each is used as a stand-alone machine.

For the purpose of this project MIMOS has developed 23 software programs for the subjects of mathematics and the English language. These software programs were developed using the LINKWAY authoring tool. The mathematics software programs were written in Bahasa Melayu. The software is designed for students in grades four, five, and six. MIMOS had already distributed these software programs in the middle of 1994, to most of the schools involved in this project.

JARING (Joint Advanced/Academic Research Integrated Networking) Project

The Educational Ministry and Malaysian Institute of Microelectronics System (MOE-MIMOS) have jointly proposed to establish the Jaringan Pendidikan Kebangsaan or the National Educational Network, which purposes to connect schools and institutions of higher learning in the country together over a wide area network (New Straits Times, 1993). This is part of an initiative to tap the synergy between the ComIl courseware authoring system and the (Jaring) network operated by MIMOS. The network will start early in 1996 as a research and development project spanning two years.

Under the proposal the MOE-MIMOS will select at least twenty schools to participate during the two-year test phase of the network. The schools selected will only have personal computers for the link, while the cost of the link and a modem to connect to Jaring will be provided under the budget which has been allocated for the project. Once linked up, the schools

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are expected to use the network for a number of activities such as carrying out projects based on subjects taught in school, exploring cross-curriculum projects, gaining access to public information in databases, sharing and development of ComIL courseware, and communicating through electronic mail.

Should the two-year test phase prove successful, the MOE-MIMOS is expected to propose that a full-fledged National Education Network linking schools and institutions of higher learning in the country be set up sometimes during the Seventh Malaysian Plan.

Target Population

The main participants in this study were teachers. The teachers are those who (a) teach CIE in phase one schools, and (b) attend workshops, seminars and/ or in-service computer program in order to upgrade their computer competency.

Sample Selection

Each school consists of two to four CIE teachers, and a total of (2-4 x 5 different locations) 15 teachers were included in the study. All CIE teachers from five schools participated in the in-depth interviews, questionnaire and computer laboratory observation. These five schools are from five rural school districts in the state of Selangor. A wide range of socio-economic classes as well as ethnic groups are represented through the schools. These factors as well as the fact that these districts are in the introductory phases

(i.e., phase one schools) of placing a large number of microcomputers into the classrooms are the primary reasons for selecting this particular set of schools to examine teachers' computer uses in education.

Districts and Schools

Five districts (Kajang, Hulu Selangor, Kuala Langat, Serbak Bernam, and Kuala Selangor) and five schools, one from each district, were selected as sites for the research. The location of the districts is shown in Figure 3.0.

The schools from the state of Selangor are:

- 1) Maad Hamidiah (Agama) Secondary School, Kajang;
- 2) Kampung Soeharto Secondary school, Hulu Selangor;
- 3) Batu Laut Secondary School, Kuala Langat;
- 4) Simpang Lima (Agama) Secondary School, Sabak Bernam; and
- 5) Jeram Secondary School, Kuala Selangor.

Changes of the CIE Teachers

At the early stage of the implementation of the CIE project, teachers from the schools involved in the project were selected to be the CIE teachers. These few potential teachers were selected by Ministry of Education (MOE) to attend extensive computer training and later became the resource or key person for CIE program. After the training, the key teachers had a leading role in their schools to train other CIE teachers. But, when the MOE was faced with the need to increase the use of microcomputers more widely, these

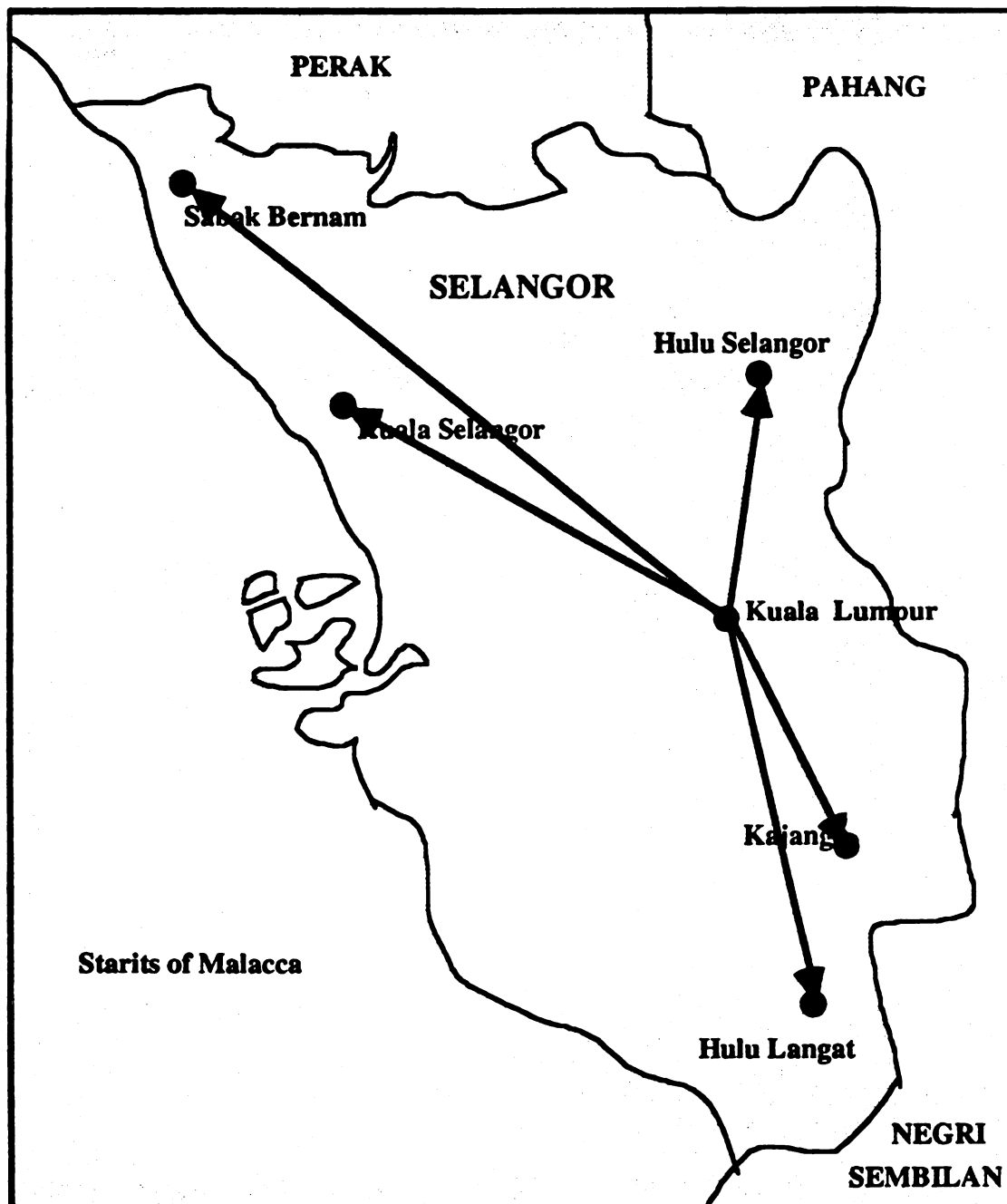


Figure 3.0 Selangor and its Districts

teachers to be used as training resources by the Education Ministry, and what was left in the schools are teachers who were partially trained or not trained at all in the use of microcomputers.

In the process of the implementation, these resource teachers did not stay long as CIE teachers or as a training resources. Several of them left their roles as CIE teacher or even as a resource person from MOE, to pursue their studies further in computers at the local institutions. In the study I expected to study the initial teachers, but the teachers that I got to study were the left over or secondary teachers. The absence of the initial teachers was caused by MOE, and teachers leaving their roles as a resource persons to pursue their studies had become a major leveler to what differences might exist among teachers.

I expected a great difference among teachers on the use of microcomputers; but, due to major changes of teachers that I was able to study, the analysis of the data was more difficult, making it harder to find differences among teachers.

Data Collection

The data collected and analyzed are from these sources:

- A) Questionnaire administered to the CIE teachers (see Questionnaire in Appendix A)
- B) In-depth interviews of the CIE teachers using interview guides (see Interview Guide in Appendix A);
- C) Observation of computer laboratory (see Observation Guide in Appendix A).

The overall data collection effort is summarized in Table 3.0, which identifies the conceptual variables and specifies procedures used to collect data from participants.

Questionnaires

Questionnaires were used to obtain data such as teachers' attitudes toward the computers, the activities that were carried out with the students in the computer laboratory, and the past and present barriers in using the computers. The questionnaire was to teachers prior to their initial interviews.

Table 3.0

Methods and sources of data collected for the study.

Conceptual Variable	Method	Sources of Data
General Context	Interview	Teachers
Teachers Background characteristics	Interview	Teachers
Attitudes and Concerns	Interview; Questionnaire	Teachers
Microcomputer Use	Interview; Observation	Teachers I
Experience Using Computers	Interview; Observation	Teachers I

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Interviews

The fifteen CIE teachers were interviewed twice. These was one initial and one follow-up interview. After the first interview, the follow-up interview was carried out somewhat later. The purpose of conducting the follow-up interview much later was to get further clarification from the teachers; if I found any conflict with what they had said in the first interview and with what they had accomplished during computer laboratory observation sessions, I noted this discrepancy.

Observations

In addition to gathering information about the physical facilities and the availability of equipment in the computer laboratory, the data obtained through observation sessions were used to verify what the teachers said in the interviews. This coincided with what they were performing in the computer laboratory. Detailed description of the observation is presented later in this chapter.

Structure of Research Instruments

This study was conducted to gather information about various ways that CIE teachers used computers. Most of the questions were obtained from articles that were related to this study.

Questionnaire and Interview

Questionnaire. The questionnaire consisted of varieties of different questions that deal with teachers' attitudes, how frequently teachers use software programs, and past and present barriers faced by teachers when

using microcomputers in their teaching. The questionnaire were given prior to the interview. A common scale was used in the questionnaire and teachers were expected to rate each of the question provided.

Interview. The interview consisted of open and close-ended questions. For the close-ended questions, boxes are provided for the teachers to rate the scale. A common 6 point scale were used (i.e., scale from 0 to 5). Following right after the close-ended questions, are the open-ended questions. The open-ended questions provide respondents with an opportunity to express their feelings or ideas. In the interview, I probed some of the topics addressed in the questionnaire and in the open-ended questions.

Follow-up Interview. The follow-up interview was more of a clarification procedure. Teachers were asked to clarify some of the responses they gave if there were conflict between what they had said or written in the interview or questionnaire and what they had done during the computer laboratory observation sessions.

Computer Laboratory Observation

This was in the form of checklist, rating and describing the activities that I did to gather information about physical facilities, the availability of laboratory equipment, and the events that took place in the computer laboratory. I observed and wrote notes concerning teachers' specific use of technology.

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Topics Included

General Context.

Administrative support. To obtain information on support, the CIE teachers were interviewed to find out the nature of computer technological supports that were available to them --either financial, technical or in-service and any follow-up in-service training provided by the school or district. Open-ended questions were used to obtain this data.

Training. The types of in-service training programs that the CIE teachers have attended were noted. Other characteristics such as number of hours of training, satisfaction or relevance, and whether the training was on-going or a one-time occasion were studied. Open-ended questionnaires were used to gather this information.

School and Classroom. School characteristics such as location, size of the school, grade range, age range, socio-economic status, and number of teachers and students were collected from the teacher and from my own observations.

Teacher Background Characteristics. Demographics concerning teachers' data included gender, teaching experience, age, major subject area, and teaching experience with microcomputers. Teacher's approach, goals, and objectives were also included in the interviews.

Teacher Attitudes and Concerns. A ratings' questionnaire was used which consisted of items that addressed teacher attitudes toward the use of

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computers. In this aspect teacher needs, concerns, and future in-service needs were addressed in the interviews.

Teachers' Experience and Current Uses of Microcomputers. To get this information, close-ended questionnaires were used which consisted of items of the teacher's current practices and uses of microcomputers and from my own computer laboratory observations.

Administration of Research

My data collection began in the summer 1994. Before I started to collect the data, I obtained the necessary permission to conduct this study.

Obtaining Permission from the University Committee on Research Involving Human Subjects (UCRIHS)

Application for approval to conduct the study was submitted to UCRIHS in June. The permission was granted in July to continue the study (see UCRIHS letter in Appendix B). The reason for the application was to ensure that the confidentiality of each individual who participated in the study was protected and that he or she was duly informed of his or her rights and the requirements of the study.

Obtaining Written Consent from Participants

Consent letters were given to the teachers who participated in the study before the interview began. The purpose of the consent letters were to inform participants their rights, the requirements of the study, and to allow participants to refuse to answer any specific questions and to withdraw from participating in the study at any time.

Obtaining Permission from the Department of the Educational Planning and Research Development, Malaysia (EPRD)

The research proposal and application for approval to conduct the **study** in Malaysia was send to the Department of Educational Planning and **Research Development** of the Malaysian Ministry of Education. The purpose **was** to ensure that the research conducted met with the requirements listed **by the** EPRD. Upon completion of the study, a copy of the results will be **given** to the EPRD and will be kept in the library so that the findings can be **accessed** to the public (see EPRD approval letter in Appendix C).

Obtaining Permission from the State Education Department, Malaysia

Once the permission from the EPRD was granted to continue the **study**, permission from the state education authority needed to be obtained. **The** purpose was to ensure that the selected schools visited gave full **cooperation** to the researcher to conduct the study (see approval letter in **Appendix D**)

Conducting the Interviews

Intensive data collection began in late July 1994. My first set of **interviews** began in early August. At each school I stayed for five to seven **days** to interviews and observe the CIE teachers.

I went to each school three days before the actual interviews to **schedule** for the appropriate time with the teachers. Before the interviews **began**, to enhance the collection of data I held a meeting with the individual **teachers** involved. The purpose was to explain in detail the data collection

procedures to the teachers. All the interviews were carried out during **teachers' free time.**

The interviews were conducted in the computer laboratory. In all **cases,** only the teacher and I were present.

The first set of interviews lasted for one and one-half hours with each **individual** participant. The second interviews were mainly follow-up **interviews** to discuss and resolve any unanswered questions and on issues **that** were raised in the first interview. Second interviews lasted an average **of forty-five** minutes. Informal discussions completed formal interviews.

At the beginning of every interview, it appeared to me that it was very **important** to inform the teachers as to the purpose of the interviews. It was **found** that teachers felt very comfortable in expressing their feelings and **responding** to every question, knowing my presence was not to evaluate **their** teaching, but to understand the best of what was happening about **computer** usage in the school. Some of the teachers preferred to converse in **Bahasa** Malaysia. The common reason they gave was that they did not know **the English** language very well. They felt that they could convey their **message** better in Malay. Throughout the interviews the teachers were very **cooperative.** I found that the teachers were very willing to talk about **reasons** that hinder them from spending more time with computers. They **are very** enthusiastic about showing how they taught using the computers.

For the first round of the interviews, teachers were asked to respond to general questions. For the open ended questions, I let the teachers share as much as they wanted to. Some teachers shared their experiences, but they digressed. I found that probing questions were very useful for directing teachers to talk to matters about which I was most concerned in this study. Occasionally, I would ask the teachers to elaborate and clarify some of the points they raised. For example, teacher 3 from school B elaborated on the problems she faced with a computer.

Teacher 3:

Everytime I want to use the computer with my students, it takes about 10-15 minutes to boot up the system. Sometimes with no reason the server gave me problem. To overcome this problem, I had to reboot the system again and this takes another 10-15 minutes of my time.

Interviewer:

What caused the system to take such a long time to boot up?

Teacher 3:

I think the network software. The computer came with D-Links/LanSmart software. This software gave me a lot of problems. I wasted a lot of time in class trying to solve problem created by this software.

Through the elaboration, I was able to get further insight of common problems faced by the teachers, problems that were considered minor, wasted a great deal of teachers' time that should be used to instruct the students.

The follow-up interviews were more focused around matters arising from the first interviews. The follow-up interviews were carried out after I

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had read the answers given by teachers in the first interview and after I had **listened** to the tapes that I recorded during the earlier interview. The **direction** of the interview was much more under my control, but the teachers **were** still encouraged to elaborate as much as they wanted to.

Overall, I had the impression that the teachers were happy with my **presence**. Some teachers said that my study gave them the opportunity to **throw** out feelings and problems that had been hidden for so long. They felt **that** there is someone to listen to their needs, problems, and concerns and are **hoping** that the people at the higher level would do the same and start to **take** their problems seriously.

Conducting the Computer Laboratory Observations

For each observation session I stayed to observe for full two periods (**eighty** minutes). For all the observation sessions I remained as **unobtrusive** as possible. I went to each observation session with the **computer** laboratory observation guide. The observation guide consisted of **check**list items, ratings, and descriptions of the activities. I also generated a **list of** things to observe about each classroom, based on earlier interview **sessions** where teachers talked about how they used computers in their **teaching**, what software they used, students' grouping; interaction between **students** and teacher, and also the hardware and software problems faced by the **teachers**.

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In the observation session, I did not focus on individual teaching, but **on the** classroom processes involving computer usage. I was particularly **interested** in the hardware and software being used, physical settings of the **computer** laboratory, the amount of time and the number of students who **actually** used the computer, assignment of tasks, and other interactional **processes**.

Due to problems that were beyond the school's control, such as **electrical** wiring problem that cut off the electricity of an entire building for **months**, I was able to observe only three out of five schools. In most cases I **observed** live lessons of the teachers and their students using computers.

The observation consisted mainly of listening, rating and checking the **list** of my observation guide. Occasionally I take notes on any apparent **hardware** and software problems.

Coding of the Qualitative Data

The qualitative data were obtained from the open-ended questions **from** the interview instrument. For the open-ended questions, teachers **responded** to probing questions and were also asked to rate (using the six **points** scale) each response they gave. The common responses given by the **participants** for the open-ended questions were formed into new variables **and** were included in the data. Even though some judgment was used to **group**-like responses into the same variable, all ideas presented by the

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participants were included in the list of variables. The responses to open-ended questions from each participant were coded (each response of the open-ended questions given was also rated by teachers using six points scale) and merged with the quantitative data and entered in the worksheet using SPSS.

Coding Quantitative Data

The quantitative data were obtained from close-ended questions in the interviews guide and the questionnaires. For the close-ended questions, a six point scale was used. The responses given by the participants for each of the close-ended questions were included in the data.

Observation data

The observations data were used to make comparison between teachers' data and my observations data to look at the extend to which these two data agree. The main purpose of using the observation data is to confirm whether what teachers were saying is similar to what they were doing in the practice.

Reduction of Qualitative and Quantitative Data

Originally, there were about 229 variables collected with the research instruments. Due to the large number of variables coded, I wanted to reduce the size to the only ones that seemed to give the best differentiation between the groups of teachers. To reduce the size I looked at the raw data and

omitted the variables that showed no variance or very small variability among all the participants. This procedure reduced the number of variables from 229 to 64. The 64 variables included the quantitative and qualitative data. See Appendix E, for listing of the variables that were omitted. The new matrix was then produced from all 15 participants which contained 64 variables by 15 raw data matrix.

Data Analyses

In this study the approaches that I used to analyze the data were as follow.

First I used methods which were looking for some rather simple evidence of relationships among the variables. I used methods which I tried to find out whether I could work in simple ways in which evidence of relationships among these variables can be uncovered.

Second is to do more detail and intensive relationships among variables in an effort to uncover interesting but more subtle kinds of relationships that might exist.

In order to look for simple relationships among the variables, I identified a list of variables based on the model and also formed a set of composites' variables such as attitudes towards the use of computers, barriers and perceptions. I calculated the averages and totals of the each of the variables and then made a comparison between them. The purpose is to find out whether there is any difference between these two indicators.

Next I correlated each of the variables and composites from each different category of the model with one another and with the dependent variables. In all cases I was looking for the relationships among these variables.

For the more detailed and intensive analysis I looked at interrelationships among teachers' perceptions. Specifically, I excluded background information and the dependent variables. The rationale for looking at the teachers' perceptions was because I want to see whether the richness of the detail that existed helped me identify differences in the way people perceive things. I am trying to learn as much as I can about the structure that lies within their perceptions. Teachers' perceptions are used as the basis for their reality of what is going on. The next step was to see whether, by examining those perceptions, I could detect some substantial differences of perceptions among subsets of groups that I had identified. Once I had identified the differences in the subsets of teachers, I looked to see if whether there were not only differences in perceptions, but whether also differences in background experience and differences with regard to the dependent variables. In other words, I am using these perceptions as means of trying to differentiate between teachers involved in this study and also to see if there are some relationships between the differentiation revealed by the perceptions and their background variables and, likewise, if there are some relationships between the differentiation with the various kinds of variables.

Comparing Averages and Totals

For a simple analysis, first the raw data were entered using SPSS to form a matrix. The totals and averages of the raw data that include background characteristics, the dependent variables, and composites' variables were then computed. The composite variables include teachers' attitudes towards the use of computers, barriers, and their perceptions. The purpose for calculating the totals and averages for each of the variables is to look at whether there is a great difference between totals as indicators of quantity and averages as indicators of quality. The correlations between the totals and averages were then computed to find out the relationship between these two indicators.

Correlations

Each of the main variables in the instruments used a common scale. For the next step, a correlation was chosen for the analysis to see the relationships among variables. I had several independent variables that I was relating to different versions of dependent variables, that is, the observed and perceived level of use. Part of the purpose of this analysis is to try to find out whether there are some relatively simple kinds of relationships that can be examined that might exist between the independent variables identified in the model and the different measures of the dependent variables, that is, the level of use.

The nonparametric, Spearman (Rho) correlation was used for this analysis. Each of the variables from each different category was then correlated with the observed and perceived dependent variables, that is the level of use, and with other indicators.

Rationale for Using Multidimensional Scaling (MDS)

For the more detail and intensive analysis, I used multidimensional scaling (MDS). With MDS I looked at two different kinds of clusters, variable clusters and teacher clusters. For a start, I looked at clusters of variables in two ways, that is, using correlation matrix and distance matrix. The purpose was to decide which approach is best. Depending on the results of the correlation and distance analyses, the approach that gave the best result was used to look for clusters of teachers.

The rationale for using the MDS technique is because it examines relationships among entities in similarity or dissimilarity matrices, with the objective of achieving a best fit to a Euclidean distance space having relatively few dimensions. In other words, MDS attempts to facilitate our understanding of a set of relationships by reducing a matrix to a spatial analogue in which each entity is represented by its coordinates on a few dimensions.

The MDS procedure permits the use of data which satisfies minimal assumptions regarding level of measurement and satisfies some basic triangulation assumptions regarding relationships among entities. With

similarity and dissimilarity indices, values are always positive. There were no negative relationships as there were with correlation coefficients.

In the present study, dissimilarity coefficients were calculated from data scaled from none (0) to very high (5). Qualitative and quantitative variables included in each matrix analyzed were based on the same uni-polar scale, and, as a result, the indices always meant the same thing.

A very common way to look at data is to use correlations, but I think this was not the best choice here. In order to make some decision about what was best, I needed to look at the result from correlations and the result from distances. In both cases I just focused on the perceptions.

One of the main reasons that I chose to use a common scale for the variables was because I suspected that a correlation matrix would not give me very good information about what is going on. To be able to retain more information and since a common scale was used, it was also possible to calculate distances for each of the variables. The purpose is to see the interrelationships among all the variables across the cases, excluding the background characteristics and the dependent variables. The reason for computing the distances for each of the variables is because the correlation matrix computed will lose some valuable information. By computing the distances, loss of information will not occur.

Variable Clusters Using Correlation Matrix. To look for the overall analysis, the 64 variables by 15 case matrix was used to produce a 64 by 64 correlation matrix of relationships among the variables. The multidimensional scaling analysis of the correlation matrix was computed.

Three dimensions were selected so that 3-D scatterplots could be produced at a later step.

Variable Clusters Using Distance Matrix. To look for overall analysis, the 64 variables by 15 case matrix was computed into a 64 x 64 Euclidean distance matrix. The 64 x 64 matrix was then entered into the SPSS, and the multidimensional scaling was computed. Three dimensions were selected so that 3-D scatterplots could be produced at a later step. Data analysis from the distance matrix was focused on determining the similarities and differences between identified groups of teachers.

Teacher Clusters. To cluster the teachers into different groups, the 64 variables x 15 case matrix was put into the SPSS and was transposed to form a 15 x 15 Euclidean matrix for each group, and the multidimensional scaling was computed. The coordinates for 3-D were exported and input into the 3-D graphing to produce plot for each groups. The clusters of teachers are derived from analyses of perceptions.

Correlation and Distance Analyses. For analyses being done with the correlation and distance matrix, the following procedure imply. When sets of coordinates resulting from MDS are plotted, the display reveals the position of each entity in a space which has been inferred from relationships in the starting matrix. With MDS, the graphical plot is the main result since distances among entities are the focus of the MDS procedure, and

interpretation of the plot requires looking for clusters, patterns, flows and structures of entities within the space. The types of bipolar relationships which may facilitate interpreting axes in factor analysis should not be expected with MDS. The axes do not necessarily mean anything for such data.

For this research, 3-dimensional plots were generated because they yielded more easily interpreted results than did 2-dimensional plots of the same data. Plots were limited to 3 dimensions because understanding and conveying results in four or more dimensions is very difficult. Since the orientation of axes is arbitrary in MDS, plots were rotated in order to make clusters and patterns of variables as visible as possible.

3-Dimensional Plot

To look for clusters in a plot, the raw data were formed into a distance matrix. The matrix was then entered into the SPSS and MDS analysis was computed. Three dimensions were selected so that 3-D scatterplots could be produced at a later step. Specifically, a vector plot was constructed for the 3-D plot. The purpose of the 3-D plot was to present a spatial analogy to show the positioning of the participants in three dimensional spaces and to show the relationships between the participants. To understand the process of making use of multidimensional scaling to produce a plot, here is a very small example of multidimensional scaling and the 3-D plot.

The data from the raw matrix were put into SPSS and the MDS of the variables were computed. The 3 dimensional coordinates for the variables

(see the example variables shown in Table 3.1) were exported from SPSS and input into 3-D graphing selection of the Systat to produce the plot. The 3-D plot of the variables is shown in Figure 3.1. The vertical dimension ranges from 3 to -2, the left dimension ranges from -2 to 2, and the right dimension ranges from -1 to 1.0. Corresponding to the information in the Table 3.1, the 3-D box is just big enough to just include all the coordinates of the variables in the plot.

The dimensions of the plot are not labeled. The labels for the dimensions do not necessarily give any meaning. A 3-D plot arranges the dimensions so that there is a maximum separation among the points and forms clusters, not necessarily producing dimensions that are interpretable. The purpose of the graph is to show the positions of the respective participants or the variables in three-dimensional graphics. The large white dots in the 3-D plot indicate that the positions of the variables are closer to the upper region of the cube, and the large black dots indicate that the positions of the variables are closer to the lower region of the cube. As the dots get closer to the origin, they become much smaller. The vertical dimension of the 3-D plot has the greatest proportion of variance associated with it, in comparison to the other axes, and goes progressively down in each dimension.

To read a 3-D graph, one should visualize the 3-D plot as a cube with a 0,0,0 origin as the center of the cube. The placement of each respective vector should be imagined as springing from the origin within the perceived cube. The relative positioning of variables indicates relationships when using this perspective.

Table 3.1

3 Dimensional Coordinates of the Variables from MDS.

<u>Variable</u>	Vertical	Left	Right
	<u>axis</u>	<u>axis</u>	<u>axis</u>
"FOLLWTRN"	-1.691	.377	.180
"STAFFDEV"	-1.961	-.768	-.160
"PRINCIP"	.806	-1.088	-.632
"DISCOMIS"	.892	-.503	-.807
"PERIODLA"	.295	-.394	.597
"TIMECRN"	2.215	.192	-.295
"CLSSMGCR"	2.732	.128	-.460
"MORETRN"	2.979	.317	.111
"OTHERSOF"	-1.341	-.182	-.094
"WORKGP"	-.134	-.092	-.054
"FINANCIA"	2.673	.233	-.226
"DAYS"	.126	1.007	-.189

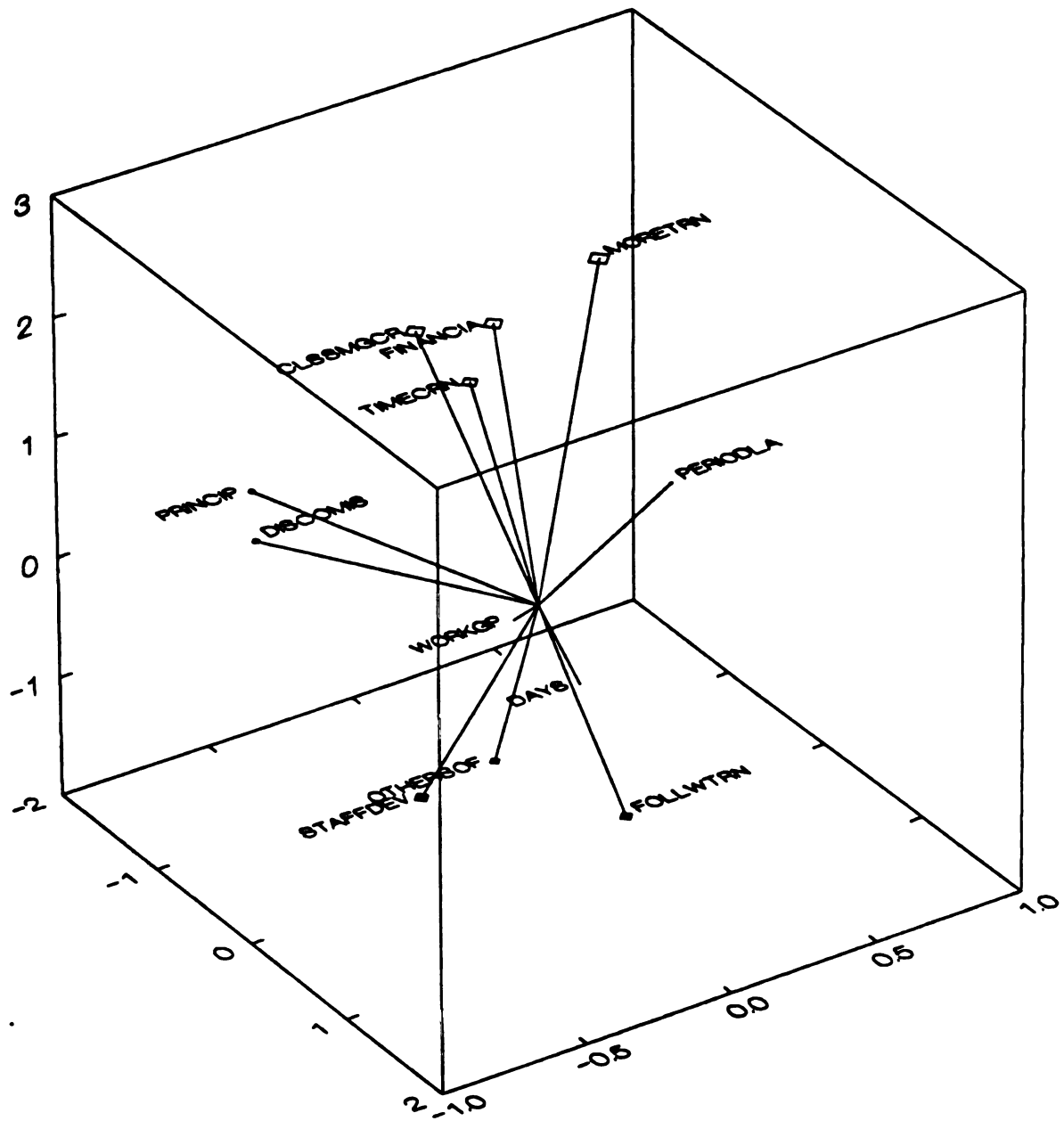


Figure 3.1 3-D Plot of Variables

Group Differences

Once the groups had been identified, the next step was to look for simple relationships of the background variable between the differentiated groups, as well as look at the dependent variables. The purpose is to find out whether teachers in different groups have different background characteristics and to see the relationships with the dependent variables.

Background Characteristics

To look for the differences of the groups identified, the distribution of teachers' background characteristics was closely examined. The variables of the background characteristics were age, teaching experience, experience teaching with computers, knowledge of programming language, amount of training they had, their computer knowledge, and computer usage at home and prior to the training given by the education ministry. The distribution of teachers' background characteristics and with the dependent variables was tabulated and contrasted. Differences in the distribution of the identified groups will be described in detail in the next chapter.

Perceptions

Once the groups had been identified and differentiated, the next step was to look for group differences and similarities based on the 64 variables, excluding the background information and the dependent variables. This was to look for more subtle relationships that might exist within the perceptions themselves.

I did the same procedure with the MDS and 3-D plot and also plotted the drop-line graph. I compared 64 variables between the two groups, trying to look the most similar and most difference of the variables. In other words, I was looking for the variables where these two groups have very similar perceptions and also looking for variables where these two groups have very different perceptions. I was not just looking for simple things such as the drop-line, but also looking for the structure of the variables.

In order to this, the 64 variable x 14 case matrix was split into two 64 x 7 matrices for the two groups. The 64 x 7 matrix for each group was put into SPSS, and the MDS was computed. The coordinates for the 3-D from the MDS were exported and then put into the 3-D graphing selection of the Systat to produce a plot. Specifically, a vector plot was constructed for the 64 x 7 matrix for each group.

Plots

Once the 3-D plots had been drawn for the different groups identified, the 64 variables positioned in the 3-D plots for the groups were compared. To look for similarities and differentiating variables for each group, the 64 x 7 matrix was put into the SPSS, and the MDS was computed. Then 3-D plots were done for each groups. The 3-D plots were rotated to obtain a common core as similar as possible for both groups. The drop-line graphs for each group were also plotted. The drop-line graphs were used as the final decision about which variables can be formed into a set of similarities variables and a set of differentiating variables. The variables were separated into two sets, one set containing the similarities variables and the other

containing the differentiating variables. Each set of variables was plotted for each group. The descriptions of the differences and similarities of the identified groups were presented in detail in chapter four.

Graphs

Another way to look at the same data was to use descriptive statistic. The mean for group 1 and the mean for group 2 for each of the variables were calculated using the SPSS program. The means of each of the 64 variables were compared between group 1 and group 2. The means of each 64 variable of the identified groups were used to plot a drop-line graph to find the differences and similarities between groups.

Statistics

Descriptive statistics were used to determine the distributional characteristics of each of the 64 independent variables (see Appendix F).

The third way to look at the same data is to use non-parametric Mann-Whitney Use test. The 64 variables by 7 case matrix for each group was entered to the Systat program to compute for the Mann-Whitney Use test. Due to the small sample, non-parametric Mann-Whitney Use test was computed to test for differences and similarities in the distribution on each variable between the two groups of teachers. The purpose of using the Mann-Whitney test was not to determine the statistical significance of variables, but to look at which variables contribute to the distinction between the identified groups. The results of the test are presented in detail in Chapter Four.

Teachers' Attitudes

There were 20 attitude variables which were not included among the 64 variables. The main reason for the separation of these attitude variables from the rest of the 64 variables was that the scale used to rate the attitude statements was different. The 20 attitude statements included 9 positive and 11 negative statements. When analyzing teachers' attitudes toward the use of microcomputers between the groups, all the negative statements were changed into positive statements (see Appendix G for the reflected statements). In other words all the negatively worded statements were scored in the opposite direction. When interpreting the results, one must remember that we are now dealing with all positive responses.

The 20 variables by 14 case matrix produced a score for each group. The matrix was split into a 20 x 7 matrix for each group. The score of every teacher in each group was added. The score was then ranked to see if there were any overlapping. To see whether group 1 was more positive or negative than group 2, a non-parametric, Kruskal-Wallis test was used to see whether group 1 teachers had more positive or negative attitudes than group 2 teachers.

The attitude variable was also correlated with the dependent variables to look for some simple relationship. The results of the analyses will be discussed in the next chapter.

Perceived Barriers

There were also a number of 30 barrier kinds of variables dealing with perceptions of the past and the present. I looked at these barriers to see whether they differentiated between these groups in terms of teachers' responses to the barrier variables.

To look for the barriers perceived by teachers over time, the 30 variables x 15 case matrix was entered into the SPSS, and the MDS was computed. The coordinates for 3-D from the MDS were exported and then put into the 3-D graph selection of the Systat to produce the plot. The plot showed only the barriers for all teachers over time. To look for barriers over time and groups, the 30 x 14 matrix was split into 30 x 7 matrices for groups 1 and 2. The coordinates for 3-D from the MDS were exported and then put into the 3-D graph selection of the Systat to produce the plot for each group. The plots for groups 1 and 2 were compared to look for differences and similarities over time and groups.

The perceived barriers were also correlated with the dependent variables to look for any simple relationship. The results of the perceived barriers over time and groups and the correlations are presented in detailed in the next chapter.

Overall Summary

To summarize, the objectives of this chapter were to describe the process: (1) identify groups of teachers, (2) find background differences of the

identified groups and with the dependent variables, (3) identify similarities and differences in perceptions between groups, (4) find attitude differences between groups, and (5) identify barrier differences between groups of teachers. To analyze the data, correlation, MDS technique, 3-D plots, drop-line graphs, and non parametric statistics were used.

CHAPTER FOUR

RESULTS AND DISCUSSION

Introduction

In this study, fifteen Computer-in-Education (CIE) teachers were interviewed and observed on their use of computers in their classroom instruction. The purpose was to find what factors associated with how effectively teachers use educational technology in their classroom instruction.

Data collected from the in-depth interviews and questionnaires were based on the conceptual model discussed in Chapter One. This model focuses on five major classes of variables: (1) general context; (2) teachers' background characteristics; (3) teachers' attitudes and concerns; (4) experience using microcomputers; and (5) the dependent variables, that is level of use. These first four classes of variables is being related to the latter.

Simple data analysis focused on the relationships among variables. Intensive data analysis focused on the differences and similarities among teachers who used computer technology in their classroom practice. The discussion on all five classes of variables will be presented in terms of the specific research questions, and research hypotheses that were posed in Chapter Three.

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The Plan of This Chapter

In this chapter the objectives are:

(i) to look the overall analysis based on simple analyses. To see the group as a whole and look how things that show up in overall analysis relate to the model. The purpose is to identify some factors that are related to the model;

(ii) to look for groups of teachers. The purpose of looking for the groups is to provide a mean for identifying the contribution of these different factors:

(a) to find differences between groups of teachers in terms of their background characteristics;

(b) to look for relationships among the 64 variables. The purpose is to see if some of different component of the model for each of those groups shows up in these variables;

(c) to look for differences in teachers' attitudes toward the use of microcomputers; and

(d) to look for differences in barriers perceived by teachers on the use of microcomputers.

The remaining sections of this chapter will present a discussion and summary of the results that focus on the research questions and research hypotheses.

Comparing Averages and Totals

The first approach to analyze the data was to use simple analyses.

The following are results of the analyses.

When the correlation between averages and totals was computed for each of the variables and set of composites' variables, the results showed the correlation ranges from 0.972 to 1.000, which is very high. The results indicate that there is not much difference between averages and totals. In other words, the averages versus totals show pretty much the same indicator. There is nothing to be gained by thinking about the variables as averages versus totals or as quality versus quantity. In this case I used the averages or the quality indicator because it is much easier to deal with and the values are much smaller than the totals.

Correlations among Variables

For a simple analysis the nonparametric, a Spearman (Rho) correlation was used to see the relationships among composites' and other selected variables and with the dependent variables. Each of the variables from each different category of the model was correlated with the observed and perceived dependent variables, that is the level of use and with other indicators. The results of the correlation are shown in Table 4.0(a) (see Appendix H)

From the correlation Table 4.0(a), it is found that the observed and perceived level of use is significant correlated ($p < 0.05$). The value of the correlation between the observed and reported level of use is positively related. This indicates that what teachers were saying about their level of computer usage in their classroom are similar to what they were practicing.

The table 4.0 shows the relationships of each of the variables to the dependent variables.

Table 4.0

**Correlation Among Variables with Observed and Perceived Dependent
Variables (Level of Use)**

Variable	Dependent Variables	
	Observed	Perceived
OCONFICU	.6592**	0.33
OINTEGRC	0.17	-0.19
OCOMPK	.6397*	0.43
OLEVINTE	.7824**	0.26
AVLEVELU	.6411**	0
AVERATTI	0.17	0.05
AVGPBARR	0.5755*	0.05
AVGPRBARR	0.01	0.05
AGE	0.17	0.12
TEACHEXP	0.43	0.35
TEACOMPU	0.38	0.39
USECHOME	0.14	-0.26
BASICK	-0.02	0.03
USECPRIT	0.13	-0.04
AVCOMK	0.1	0.02

Table 4.0, cont.		
AMTTRATT	0.28	-0.09
PINTERES	0.28	-0.02
AVPCONFU	-0.03	0.36
AVPINSER	0.06	-0.18
AVPSTAFF	0.1	-0.09
AVPSUPPO	-0.14	-.5202*
AVPNEEDS	-0.03	-0.17
PINTEGRC	0.19	-0.12
AVPCONCE	-0.01	-0.14
PTRAINEE	0.14	-0.06
AVPCURRU	0.46	0.19
AVPHINDF	-0.31	-0.4

Note: * significant LE .05

** Significant LE .01

Based on the simple analysis, in relation to the model in terms of background characteristics, teachers' computer knowledge (OCOMPK) was found to be significantly correlated ($p=0.05$) with observed level of use, but not significantly correlated with the perceived level of use. This indicates that there is a positive relationships between teachers' computer knowledge and observed level of use. In other words, teachers who were knowledgeable

with computers used computers more than teachers who were less knowledgeable.

In relation to the model, in terms of barriers the correlation analysis shows that perceived past barriers were positively related to the observed level of use. This indicates that there were more barriers faced by teachers in the past with the level of use of computers than they face in the present.

The correlation table shows that the perceived dependent variables were negatively related with support provided to the teachers. This indicates that teachers perceived that support given to them was insufficient in relation to their level of computer use. Other variables did not show any correlation with either observed or perceived dependent variables.

The relationships table shows that simple analysis only gave very limited information. There are some indicators of one thing or the other here, but not enough evidence was provided to allow me to understand what is going on. I think that there is a lot that can be learned based on teachers' perceptions.

Teachers' Perceptions

Content Clusters in Teachers' Perceptions

This section examined content groups such as concerns related to the contextual that are evident for all 15 teachers and the 64 qualitative and quantitative variables. The main objective was to look at the group as a whole to see some structure in detectable teachers' perceptions. The second objective was to find out the best way to reveal the structure of perceptions.

Comparison Methods

To look for overall content clusters, a 64 variables by 15 case raw data matrix was formed into a 64 x 64 correlation matrix. Then a (MDS) was computed, and the results were put into the 3-D graph selection of Systat to produce the plot. The 3-D plot of 64 x 64 relationships matrix was drawn. Figure 4.0 in Appendix I is the 3-D plot of all variables which were drawn based on the correlation matrix. The 3-D plot showed that there was no clear structure or clusters of variables formed. This indicates that the correlation matrix did not produce a good result of the 3-D plot for the overall content clusters. The clusters formed do not make much sense.

Another way to look for overall content clusters is to calculate distances from the raw data. The 64 variables by 15 case raw data matrix was formed into a 64 x 64 Euclidean distance matrix. The multidimensional scaling (MDS) results of the 64 variables from SPSS were put into the 3-D graph selection of Systat to produce the plot. The 3-D plot of 64 x 64 relationships matrix (Figure 4.1, in Appendix I), the coordinates of the variables, is shown in Appendix I, and an abbreviation of the variables are shown in page vii. In the overall analysis (Figure 4.1, in Appendix I), from the 3-D plot, I noticed there seem to be 3 distinct regions.

The results of the distance matrix revealed the structure of the perceptions better than the correlation matrix. This indicates that analysis using the distances revealed more information that can be learned from teachers' perceptions. Based on this comparison, for the rest of the analysis I used the distance matrix method.

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In the next section I will present figures dealing with each of the 3 distinct regions resulted from the distance matrix.

Regions

Upper Left Region

Figure 4.2(a) is the enlarged view of Figure 4.1 (in Appendix I) of variables that are clustered together at the upper region of the cube. The 3-D graph shows the positioning of the respective variables in a three-dimensional graphic. The large white dots in the 3-D plot indicate that the positions of the variables are closer to the upper region of the cube, and as is seen see later in other 3-D plots, the large black dots indicate that the positions of the variables are closer to the lower region of the cube, in relation to the origin. As the dots get closer to the origin, they become much smaller. From Figure 4.1 (see Appendix I), the vertical dimension has the greatest proportion of variance associated with it; this is also the end of the highest scale of variables that are most likely to provide a meaningful interpretation. That is one of the reasons for choosing this section of the dimensions first to be highlighted rather than one of the others.

If the plot (Figure 4.2(a)) is visualized as a cube, with the origin as the center of the cube, the variables that reflect the need of support such as financial (FINANCIA) support, technical (TECHNIC) support, lab assistant (LABASSIS), classroom management (CLSSMGCR), more training (MORETRN), the number of minutes' students used computers (MINUSECO), too many periods to teach (MANYPERI), and teachers' concerned about time (TIMECRN) are found to be at the most upper region

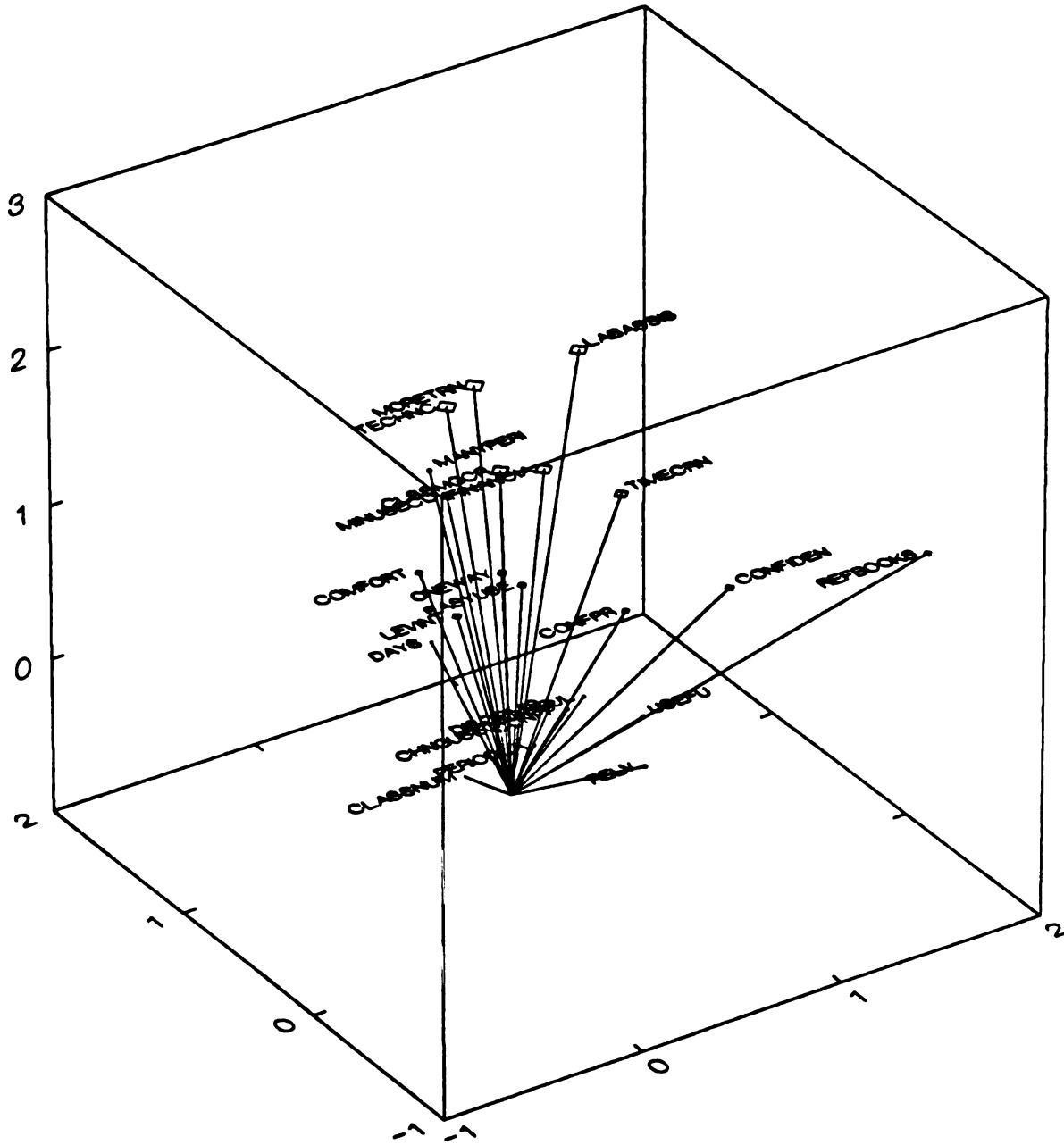


Figure 4.2(a) Enlarged View of the Upper Sector of the 3-D Plot of the Variables

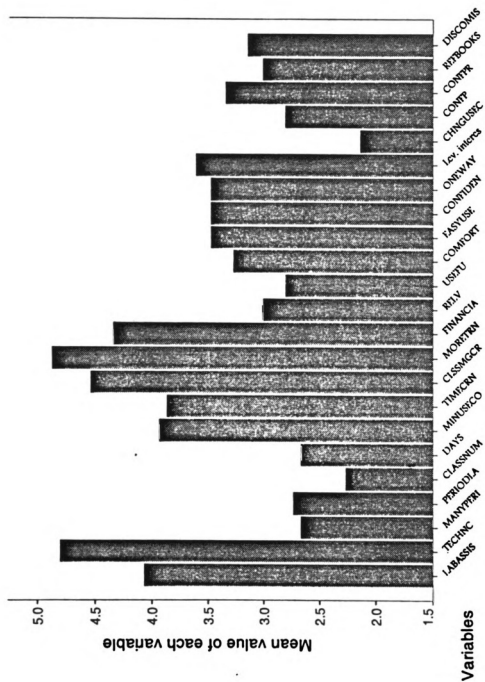


Figure 4.2(b) Bar Graph of Variables in the Upper Sector of 3-D Plot

of the cube. This section of the variable is related to the context factors in the model, more akin to general support issues. These groups of variables which are related to general support show in Figure 4.2(b) that the responses are much stronger. These variables are found to have high average means.

In relation to the model, that is, experience using computers, variables that reflect computer usage such as ease of using computer (EASYUSE), activity such as one-way presentation (ONEWAY), and variables that reflect teachers' attitudes and concerns such as feeling comfortable (COMFORT) and confident (CONFIDEN) to use the computers, teachers' levels of interest towards the use of computers (LEVINT), number days teaching computer classes (DAYS), and reference books (REFBOOKS) are found to be positioned at the middle of the upper plane. This group of variables which is related to general support, and it can be seen from Figure 4.2(b) that the responses are less extreme. These variables correspond to medium average means on the graph.

Variables that reflect practice and computer use such as the number of classes taught in a week (CLASSNUM), numbers of periods teachers used a computer laboratory in a typical day (PERIODLA), changes in use of computers (CHNGUSEC), and variables that reflect the effectiveness of the computer training such as usefulness (USEFUL), and relevance (RELV) of computer courses attended, and teacher-discussed issues related to the use of computers (DISCOMIS) are found to be located nearer to the origin of the cube. These variables can be seen in Figure 4.2(b); the response are very much less extreme and are found to correspond to the low medium average means of the graph.

Lower Right Region

Figure 4.3(a) is the enlarged view of the lower right section of the 3-D plot of 64 variables (see Figure 4.1, Appendix I). This section of the 3-D plot shows that the variables that are placed here, when related to the model, are related to the context factors, but do not show any similar concerns. The variables reflect more on issues related to availability and access problems--like lack of software (LACKSFTW), integration of the computer (INTEGRCO), software concern (SOFTWCRN), amount of training (AMTTRAI), feeling satisfied (SATISF) with the given training, computer break down (COMBREAK), problem with English language (ENGLANG), and the use of more complicated software, like BASIC--and are clustered together at one sector in the lower right region of the cube. This group of variables can be seen in Figure 4.3(b) and correspond to the low average mean of the graph. Variables that relate to context factors such as principal support (PRINCIP), success of in-service training (SUCCEF), and in-service training related to teachers' concerns are found to be located closer to the origin of the plot. This group of variables can be seen in Figure 4.3(b) and correspond to the medium average means of the graph.

Lower Left Region

Figure 4.4(a) is the enlarged view of the lower left section of the 3-D plot of 64 variables (see Figure 4.1, Appendix I). The variables positioned in this section of the cube are also related to the contextual factors when related to the model, but more directly related to computers which are related concerns. This section of the plot shows that variables that reflect the need

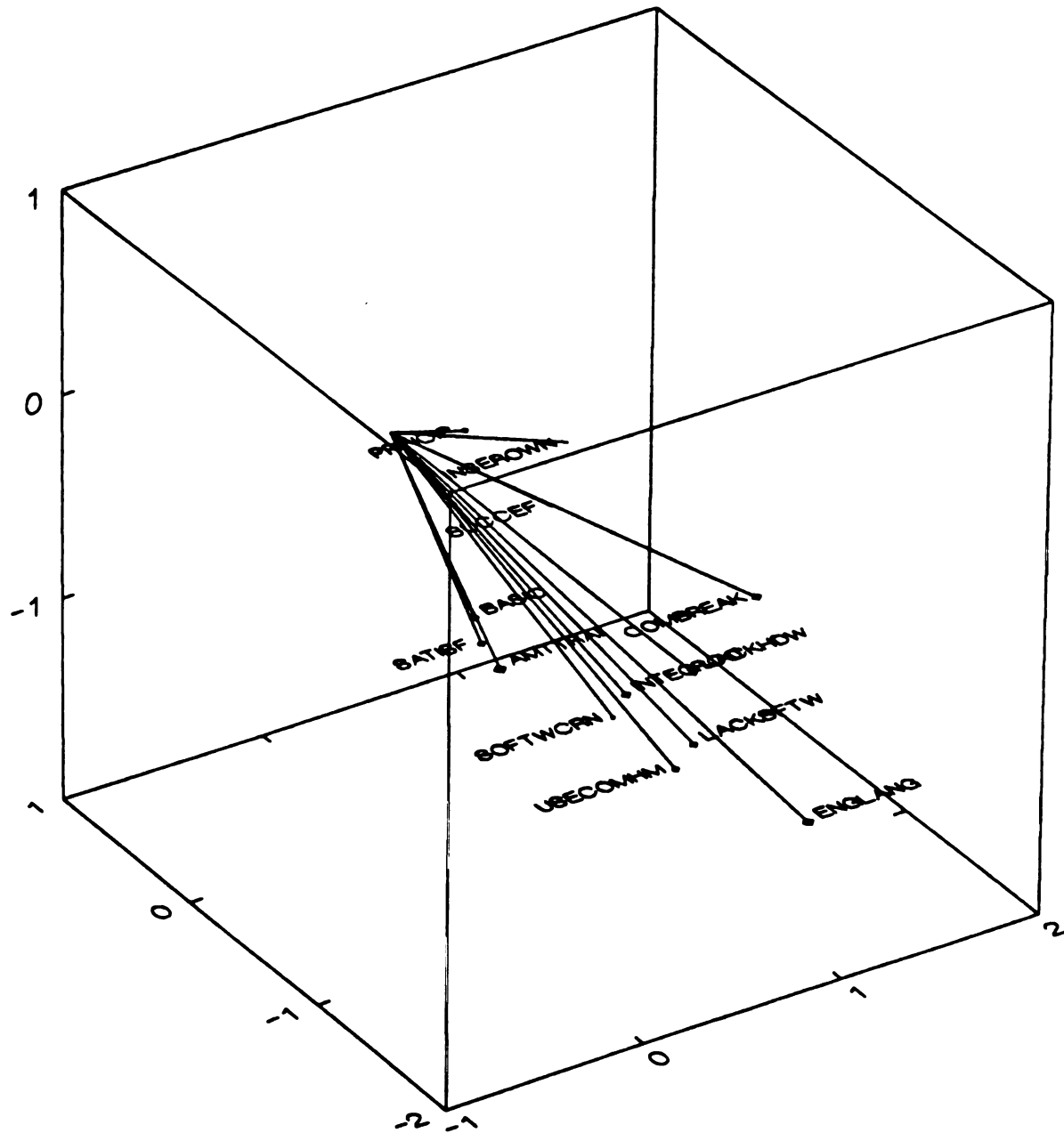


Figure 4.3(a) Enlarged View of the Lower Right Section of the 3-D Plot of the Variables

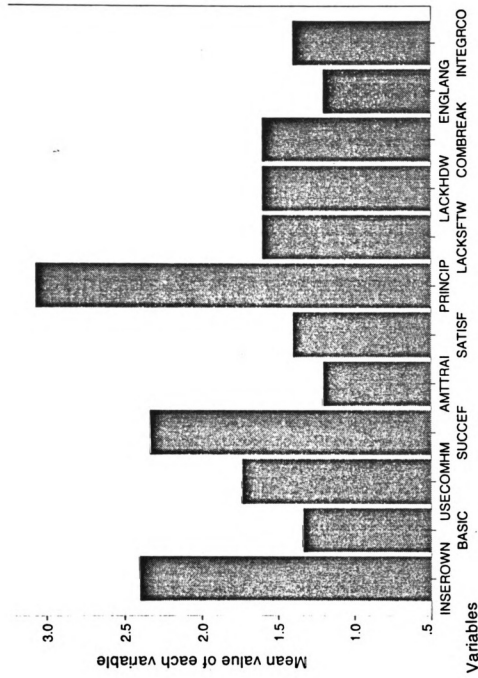


Figure 4.3(b) Bar Graph of Variables in the Lower Right Sector of 3-D Plot

for human support, like hardware representatives (HARDWREP), software representatives (SOFTWREP), computer consultants (CONSULT), staff development (STAFFDEV), and variables that reflect computer usage such as similarity in the use of computers (SIMILUSE), and the use of programming language such as Pascal (PASC) are found to be clustered at the far end of the lower left sector of the cube. This group of variables that are related to context factors when related to the model can be seen in Figure 4.4(b) and correspond to low average means of the graph.

The variables positioned at the middle of the lower left sector of the cube are less extreme, but are related to the context. These variables like computer laboratory always occupied (LABOCCUP), and adequacy of the training (ADEQ). This group of variables can be seen in 4.4(b) correspond to medium average mean of the graph.

Variables like follow-up-training (FOLLWTRN), in-service training related to teacher's concern (INSOWNCR), support from the organizer (ORGNIZSU), and observed other teachers teaching computer classes (OTHTEAR) are found to be positioned closer to the origin at the lower left sector of the cube. This group of variables are also can be seen in 4.4(b) correspond to low average means of the graph.

Summary of the Overall Analysis

In the overall analysis using the distance matrix method, I found three clusters of variables that relate to different components of the model. I think this presents fairly clear evidence that this analysis reveals some of the things that I was trying to ascertain about teachers' perceiving this whole

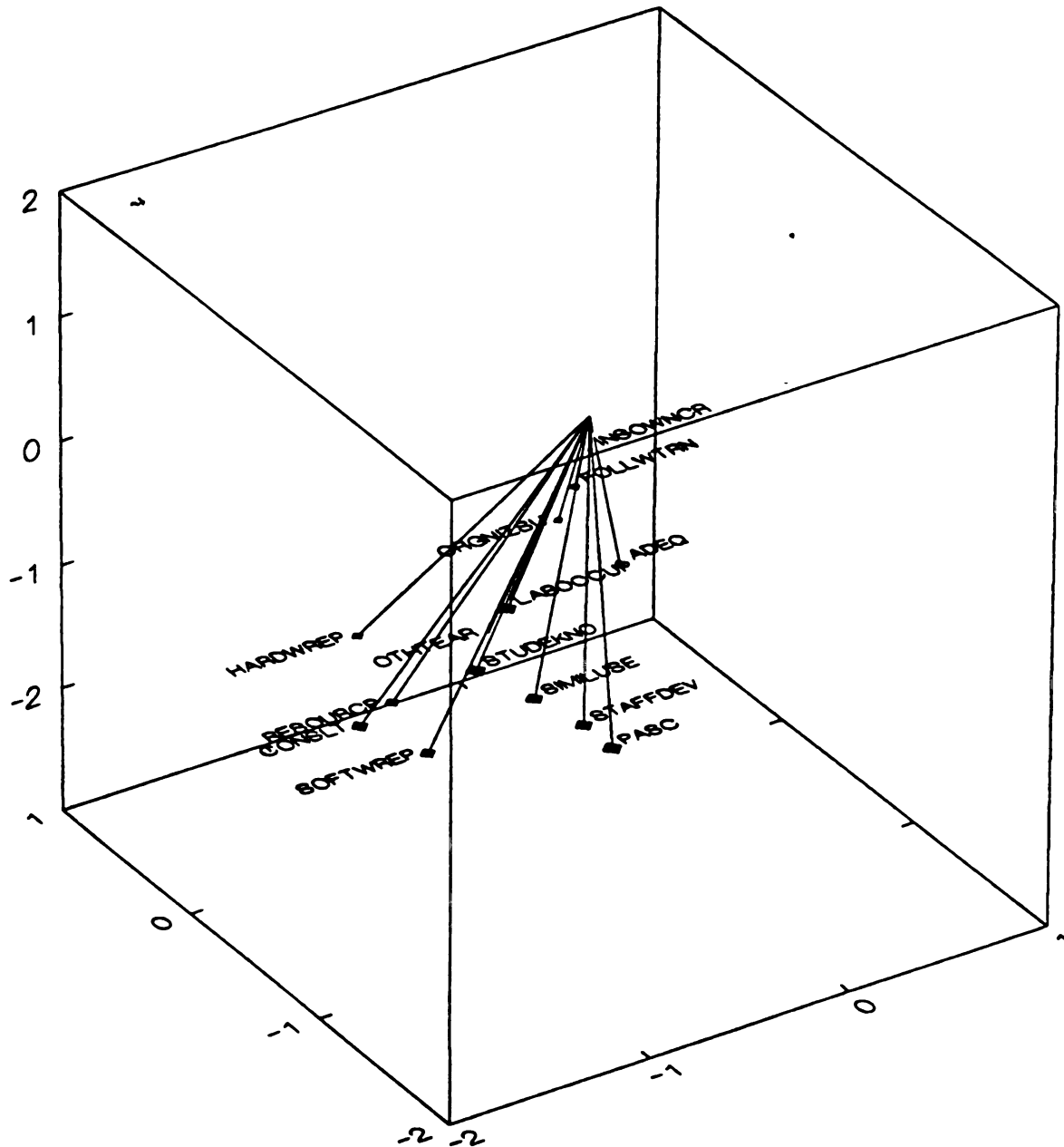


Figure 4.4(a) Enlarged View of the Lower Left Section of the 3-D Plot of the Variables

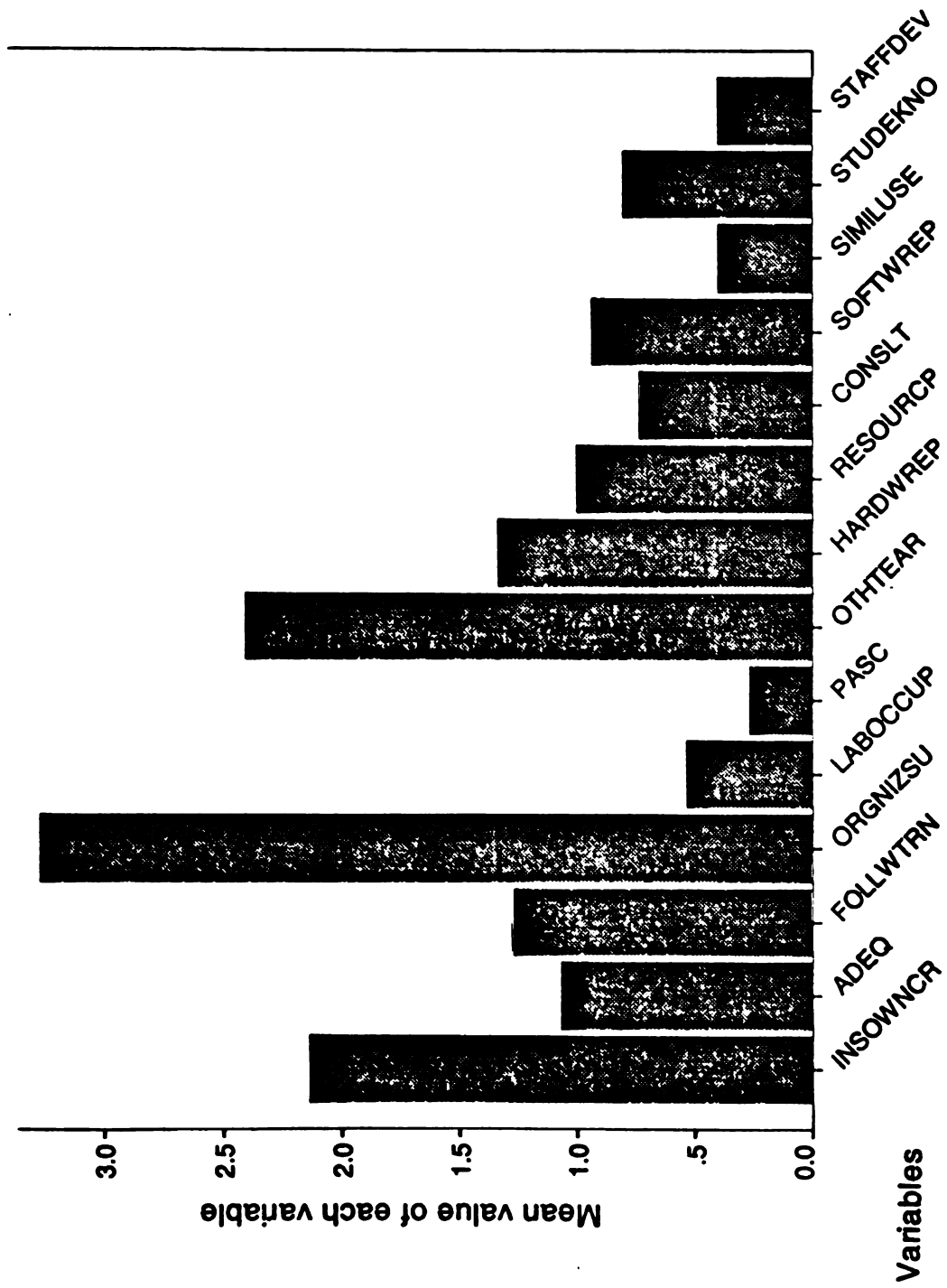


Figure 4.4(b) Bar Graph of Variables in the Lower Left Section of the 3-D Plot

situation in terms of its characteristics as related to conceptualizing the problems.

Teacher Clusters Derived from an Analysis of Perceptions

Given the fact that I see some structure in the perceptions, the next step is to find out whether this structure is different to different people. In other words, I need to see whether teachers who made effective use of computers have different perceptual structures than teachers who do not.

In the overall analysis, there are some variables that are related to the model. The next step is to (1) find out if I can differentiate these teacher, and (2) look at each of them to see whether there is some detectable structure and whether each of the structures relates to the model. The first thing I am going to look at is background difference to see whether these groups' identified differences correspond in some reasonable ways to background differences.

It was found earlier that the correlation matrix does not produce a clear structure or cluster of variables. In order to look at clusters of variables, a teachers' distance matrix method was used. To identify groups of teachers, the 64 variables by 15 case raw data matrix was formed into a 15 x 15 Euclidean distance matrix. The (MDS) result of the 64 variables from SPSS was put into the 3-D graphing selection of Systat to produce the plot. Figure 4.5 is the 3-D plot of relationships among all the teachers.

An examination of the plot shows that a set of teachers was grouped at the upper left sector of the cube, and another set of teachers was at the lower right sector of the cube. If we were to visualize running a plane diagonally

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through the space, and if we looked at the plot closely, we would find that all the ones labeled with the number 1 are located on the upper right side of the plane. It is found that all the ones labeled with the number 2 are located at the lower left side of the plane (see coordinates of all the teachers in Appendix K). In the plot I observed there are two clusters of teachers. Since there are two groups of teachers, the teachers are labeled with letters from A to O. The plot it shows that teachers A, B, H, I, J, L, F, and N are clustered at the upper right side of the plane. This group of teachers is called group 2, and the letter for each teacher is followed by 2 in the plot. The remaining teachers D, E, G, K, M, and O are clustered at the lower left side of the plane. This group of teachers is called group 1, and the letter for each teacher is followed by 1 in the plot.

Teacher C, who is not labeled with number 1 or 2, seems not to fit into either group. The case of teacher C will be described in more detail later in this chapter.

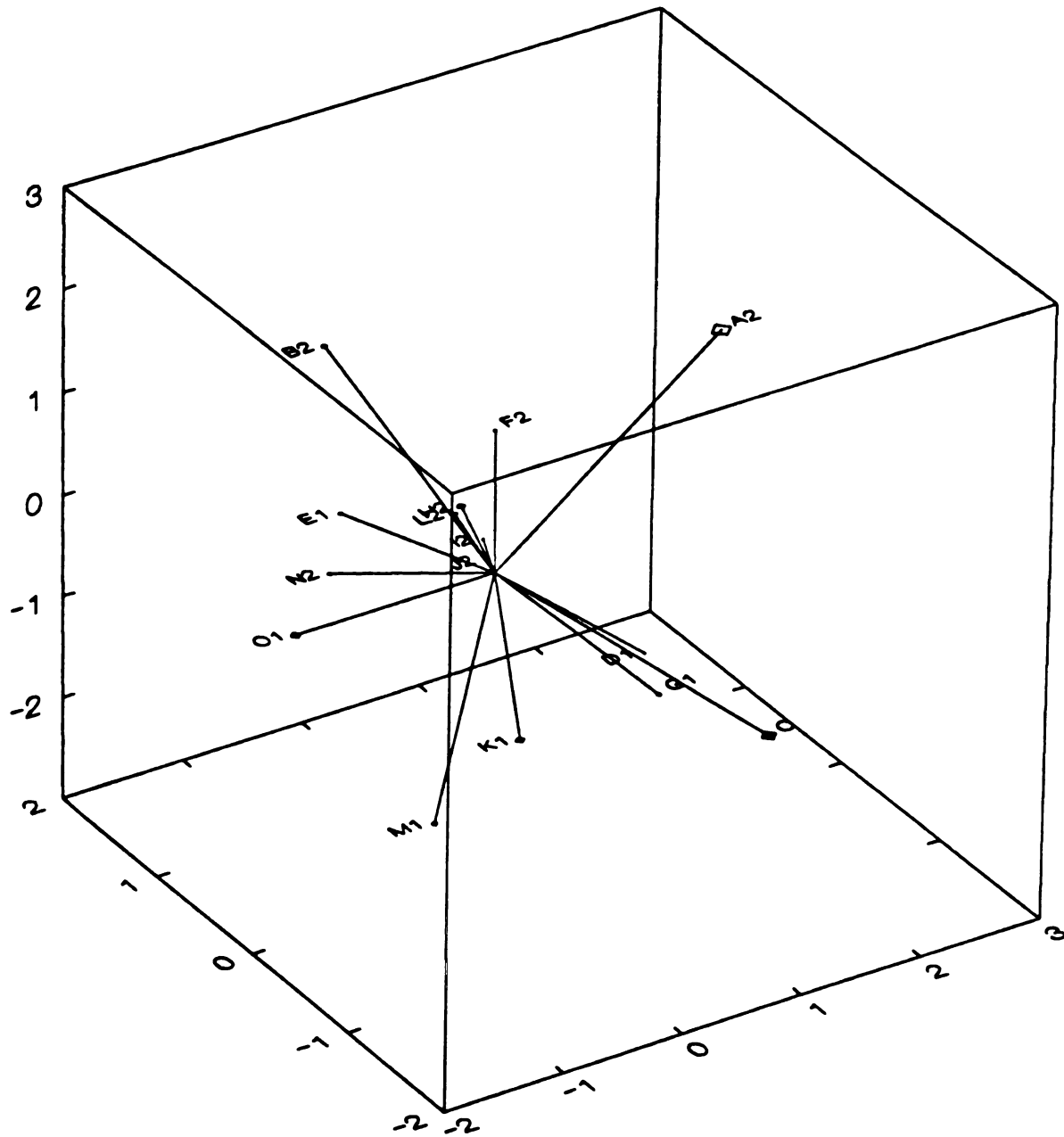


Figure 4.5 3-D Plot of Teachers

Contrasting Background Characteristics of the Groups Identified

Since we have identified the groups, we now look at how these two groups can be differentiated based on their background characteristics.

Background Characteristics

To understand the differences between the two groups of teachers, the distribution of teachers' background characteristics such as their age, teaching experience, experience teaching with computers, knowledge of programming language, amount of training attended, computer usage prior to training, and computer usage at home for individual teachers in each group were closely examined. The percentage of the distribution of variables for the teachers in each group was computed. Table 4.1 presents the results of the analysis. As seen from the table, several differences were found between the two groups of teachers.

Teachers in group 1 were found to be a more mature than group 2 teachers. About 83.33% of group 1 teachers were in the age range of 26-35 years, in comparison to 50.00% in group 2. About 16.67 % of group 1 teachers were in the age range of more than 35 years. The percentage of teachers in this range was much higher for group 2 teachers, about 32.50% . About 12.50% of group 2 teachers were in the age range of 20-25 years, but none of the teachers in group 1 were in this age range. Overall, in terms of age, group 2 teachers were much younger than group 1 teachers.

Table 4.1 showed that group 1 teachers had more teaching experience in comparison to group 2 teachers. About 50.00% of group 1 teachers had 1

to 5 years of experience in teaching, in comparison to group 2, which was 83.33%. The percentage of teachers in the range of 11 - 15 years of teaching experience for group 1 was 32.50% which was about twice the percentage of group 2 teachers (16.67%). About 12.50% of group 1 teachers had 16 - 20 years of teaching experience, but none of the teachers in group 2 were in this range of years of teaching experience.

In terms of experience teaching with computers, about 12.50% of group 2 teachers had less than three months' experience in teaching with computers, but none of the teachers in group 1 were in this range. About 25.00% of group 2 teachers had less than one year's experience, about 33.33% in group 1, and about 25.00% of group 2 teachers had two years' experiences in comparison to group 1 teachers, which was about 33.33%. About 33.33% of teachers in group 1 had three years' experience in comparison to group 2, which was about 32.00%.

In terms of BASIC programming language, it was found that group 1 teachers were more knowledgeable in BASIC programming language (about 83.00%) than group 2 teachers (only about 12.5%). The data collected shows that group 1 teachers learned computer programming in many different ways. Some of them have taken the advantage of the in-service training offered by the education ministry, some have taken courses in their undergraduate schools, and some learned on their own.

In terms of amount of training attended, Table 4.1 shows a very large difference between the two groups. About 66.67% of teachers in group 1 had attended in-service training. Only about 12.50% of teachers in group 2 had attended in-service training.

Table 4.1

**The Difference in Background Characteristics Between
Group 1 and Group 2 Teachers**

Variable	Group 1 %	Group 2 %
Age		
20-25 years	0.0	12.50
26-35 years	83.33	50.00
>35 years	16.67	32.50
Teaching experience		
1-5 years	50.00	83.33
11-15 years	32.50	16.67
16-20 years	12.50	0.0
Experience teaching with computers		
less than 3 months	0.0	12.50
less than 1 year	33.33	25.00
2 years	33.33	25.00
3 years	33.33	32.00
Knowledge of BASIC programming language.	83	12.5
Amount of in-service training attended	66.67	12.5
Used computer prior to training	83.33	62.5
Use computer at home	83.33	12.5

About 83.33% of teachers in group 1 had used computers prior to the training given by the education ministry, in comparison to group 2 only about 62.5%.

About 83.33% of group 1 teachers have a computer at home, and only 12.5% of teachers in group 2 own a computer.

Summary of Background Characteristics

The 3-D plot of all the teachers (see Figure 4.5) reveals that eight teachers, all positioned at the upper right side of the plane, can be formed into one group (that is group 2). The six teachers, all positioned at the lower left side of the plane, can be formed into another group (that is, group 1). These two groups of teachers can be differentiated based on their background characteristics. The results (see Table 4.1) imply that there are major differences between these two groups. Looking at Table 4.1, the result seems to be what is expected. Group 1 teachers were more mature, more teaching experienced, more experienced in teaching with computers, attended more in-service training, and were more knowledgeable on the use of computers in comparison to group 2 teachers. In group 1, many teachers had used computers prior to the training, and more than half of the teachers owned a computer, in comparison to teachers in group 2. Based on the above results, when related to the model, background characteristics were found to be associated with teachers' perceptions on their use of computers in their classroom practice.

An Exception (Teacher C)

From the 3-D Plot in Figure 4.5, teacher C was found to be located at the lower right end of the space of the cube, very far separated from group 1 and group 2 teachers. To examine teacher C more closely, a brief case study is presented.

Case study... is a method for learning about a complex instance, based on comprehensive understanding of that instance obtained description and analysis of that instance taken as a whole in its context (Jacob, 1989, p. 9.)

Background Information on Teacher C

Teacher C was an experienced teacher and computer user. He had taught for about 15 years and had used computers for over 5 years. He taught computers as a subject since the CIE was launched in 1991. He was the only teacher in the study who had originally volunteered to be a CIE teacher. He was the original CIE teacher in the school.

Teacher C had taught computers as a subject to Form 1 and 2 students. In his school, he had taught 12 classes, that is 5 classes in Form 2 and 7 classes in Form 1. He taught about 31 periods in a week (one period is 40 minutes). He uses computers 5 days in a week.

Besides using computers in school for teaching purposes, he had also used computers outside his work in a number of different ways. He used computers in his social activities such as creating meeting schedules, making flyers and cards, and data analyses for his own research.

Teacher C had taken computer courses at a teacher training college during his undergraduate studies. He had attended almost all the in-service

training given by the education ministry. Besides gaining computer knowledge by participating in all the training provided by the organizer, teacher C also had attended conferences and workshops on his own time. He had taken courses like spreadsheet, database, and wordprocessor prior to training given by the organizer.

As a key resource person to the MOE, teacher C had taught sessions in staff development on how to use computers in teaching to other CIE teachers from other schools in his district. He had served as a school resource person for microcomputer usage.

In addition to teaching computer subjects in school and giving in-service training to teachers on how to use computers in teaching, teacher C also had skills in developing technology-based teaching materials. He collaborated with colleagues in MIMOS to produce educational programs using the LINKWAY authoring software. He also had participated in a ComIL training program (ComIL is another authoring tool created by MOE-MIMOS that uses Bahasa Melayu terminologies). With teacher C's vast experience of using computers, he was frequently invited by the MOE to share his knowledge and experience in the use of computers by teaching in other schools.

Computer Use in Teaching

Teacher C uses most of the application software programs frequently (twice a week) to teach computers to students, including word-processing, spell-checker, spreadsheet, database, draw and graphic production. Once a week, he taught BASIC programming language and used problem solving

programs. For low ability students, he used more tutorial and drill-and-practice software.

In terms of classroom activity with his students, he practiced a two-way presentation approach regularly, using them almost every day, -- with students exploring instructional computer programs on their own and creating their own products.

In his classroom, teacher C used a mix of lecture and a hands-on method. Usually before he started his classes, he reviewed the problems that the students had from the last class. In doing this, he was sure that his students had overcome any obstacle that prevented them from moving to the next step. He encouraged his students to present their work to the class, and wanted his students to be creative. Teacher C perceived himself to be a very flexible teacher. For his class project, he wanted his students to produce anything related to the lesson he had taught them. He said that students at this age (13-14 years old) were very imaginative. They should be given the freedom to create whatever they want based on knowledge that they had learned. For outside school activity, he encouraged his students to become involve in competition and projects related to the use of computers. His students were the most productive of his school and had won several competitions in the state related to the use of computer technology.

Summary of Teacher C

To summarize, teacher C who was highly knowledgeable about and comfortable with the use of computers in his teaching put technology to use in ways to make students more creative. He seemed to take a flexible

approach to his teaching with computer technology. He emphasized students' making their own products based on what they had learned. In structuring project-based learning activities for his students, he appeared to be helping students engage actively with the computer technology and, more importantly, with the materials and topics his students were learning.

Teacher C was studied separately from the rest of the teachers because of his vast experience of computer usage and different approach in teaching in comparison to the others in this study. Even though teacher C was far separated from the rest of the teachers, he was closer to group 1 teachers which is the more experienced group.

Based on the case of teacher C, it can be concluded that in relation to the model, background characteristics such as knowledge about computers, teaching experience, and experience teaching with computers are very important, and they clearly affected how people perceived the use of computers. In terms of context, factors such as amount of training given to the teacher also associated with the ways teacher's uses computers in their practice.

Observed and Reported Level of Use Between Groups

For the simple analysis, I looked at the relationships of dependent variables to see differences between the two groups. The distribution of observed and reported dependent variables, that is, level of use and other indicators such as confidence in the use of computers, teachers' computer knowledge, teachers' level of interest towards the use of computers, and integration of computers into subject matter were computed. Table 4.1(a)

shows the distribution of observed and reported dependent variables with other indicators.

From the table the distribution of dependent variables shows radically different results between what I observed teachers were doing and what they reported. From my observation I found that teachers were using the computers more than they thought. Perhaps these teachers were more concerned with what they were using the computers for. I observed that teachers in group 2 who were less knowledgeable about computers generally used the machines more than what they had reported. Perhaps these teachers were not sure about what their level of use really was. Probably, they did not have much basis of comparison for their levels of use.

In terms of confidence in the use of computers, I observed that teachers in group 1 were more confident in their computer usage than what they had reported. Teachers in group 2 do not show much difference.

In terms of computer knowledge, I found that group 1 teachers showed no difference between my observation and what they had reported. For group 2 teachers, they reported that they did not know much about computers, but I observed that they were really trying to use computers in their practices.

In terms of integration of computers into subject matter, I found that group 1 teachers did not show any difference between what I observed and what they had reported. I found that teachers in group 2 did not integrate computers as much as what they had reported. This is most probably because teachers in this group thought that integration of computers meant

Table 4.1 (a)

**The Distribution of Observed and Reported Dependent Variables
(Level of Use) and Other Indicators.**

VARIABLE	OBSERVED		REPORTED	
	GP1(%)	GP2(%)	GP1(%)	GP2(%)
Level of Use				
L	33.33	25.00	83.33	50.00
M	66.67	75.00	16.67	50.00
H	-	-	-	-
Confident comput. use				
L	-	12.50	-	12.50
M	33.33	62.50	83.33	75.00
H	66.67	25.00	16.67	12.50
Computer knowledge				
L	33.33	-	33.33	87.50
M	33.33	37.50	33.33	12.50
H	33.33	62.50	33.33	-
Integrate computer				
L	33.33	100.00	33.33	75.00
M	50.00	-	50.00	25.00
H	16.67	-	16.67	-
Level of interest				
L	-	-	-	12.50
M	66.67	25.00	50.00	25.00
H	33.33	75.00	50.00	62.500

what they had learned was being applied in their teaching of the computer subject, which is totally different from the integration of computers into other subjects.

In terms of teachers' level of interest toward the use of computers, I found that the level of interest for both groups was less than their level of use. This is most probably because these teachers were not satisfied with support such as training, financial, and administrative provided to them. The result of lack of support and other factors such as computer problems and other barriers reduced their interest towards the use of the computers.

Summary of the Level of Use Between Groups

Based on the simple analysis, it was found that some observed and reported dependent variables between groups and with some other indicators were different, and some were found to be pretty much the same. The results of the distribution indicated that some teachers reported differently than what I observed; perhaps they were not quite sure with the level of use really was.

Summary of Procedures

In the next section, plots, graphs, and statistics were used to compare the groups to identify similarities and differentiating variables. Once the similarities and differences between the groups are identified, they will be discussed in graphs, plots and statistics simultaneously. The results of the similarities and differences after comparing both groups are interpreted based on the model.

Similarities and Differences in Perception of Groups 1 and 2

Once I had identified background characteristics that were related with the identified groups, I also identified the relationships that existed with the dependent variables. The next step was to see whether I could take a fairly intensive look at the structure of the perceptions. The objective was to find out whether I could contrast these two groups in terms of the structure of the perceptions that emerged from multidimensional scaling that could be related to the model.

In order to do the intensive analysis, I had to follow some procedures. The 64 variables by 14 case matrix (teacher C was pulled out from the 15 cases) was formed into two matrices of 64 variables x 7 case each. Multidimensional scaling (MDS) of each of the matrices was made, and the results were put a the 3-D graphing selection of Systat to produce a plot. To identify similarities and differentiating variables for each of the groups, drop-line graph for all 64 variables was plotted. The 3-D plots of all 64 variables for each group were rotated to look for common cores as similar as possible for both groups. The drop-line graph of all 64 variables among groups was drawn. The plots and graphs for both groups were closely examined. Once the common core had been identified, the drop-line graph of all 64 variables was also used to select which of the 64 variables could be formed as a set of similarities' variables and a set of differentiating variables. In other words, which of the 64 variables were going to be included in the plot showing the variables where groups 1 and 2 differed, and which variables were going to be included in the plot showing the variables where

groups 1 and 2 are pretty much the same. Once the similarities and differentiating variables had been identified, the plot for each of the groups showing the similarities and differentiating variables was plotted, and then compared and contrasted to look for similarities and differences between the two groups.

Similarities of Groups 1 and 2

3-D Plots. 3-D plots for groups 1 and 2 showing all 64 variables were rotated to get a common core as similar as possible. Drop-line graphs of all 64 variables among groups were also drawn and used as the final decision regarding which variables were similar and which were differentiated variables. 3-D plots of the similarities and differences' variables were then plotted for each group. Figure 4.6 is the 3-D plot of similarities variables for group 1 teachers (see coordinates of the variables in Appendix K). Figure 4.7 is the 3-D plot of similarities variables for group 2 teachers (see coordinates of the variables in Appendix K). Based on the similarities graph between the two groups, I noticed 3 identifiable groupings that showed very similar blocks. In the next section I will present each of the groupings in more detail.

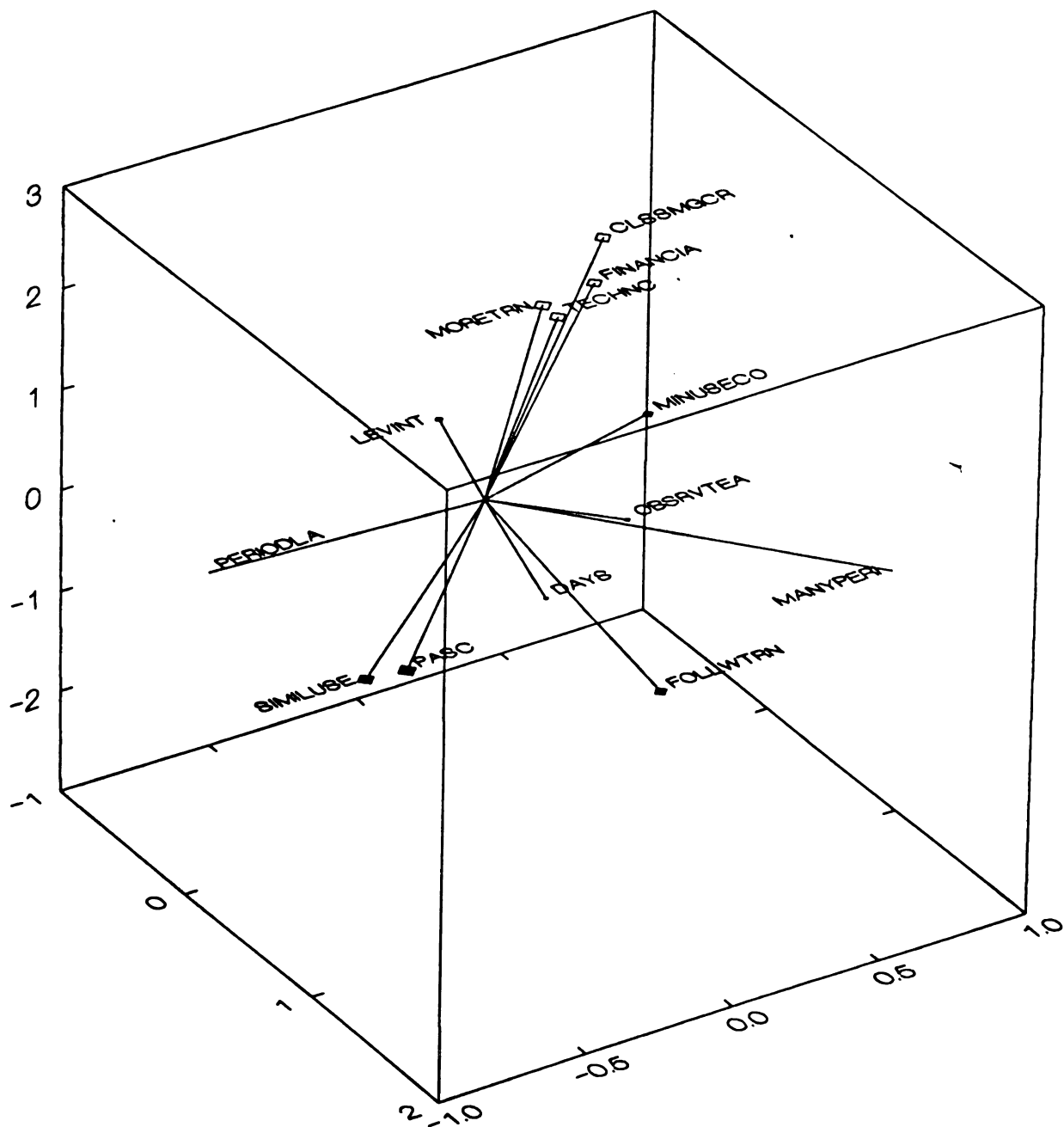


Figure 4.6 3-D Plot of Similarities Variables for Group 1

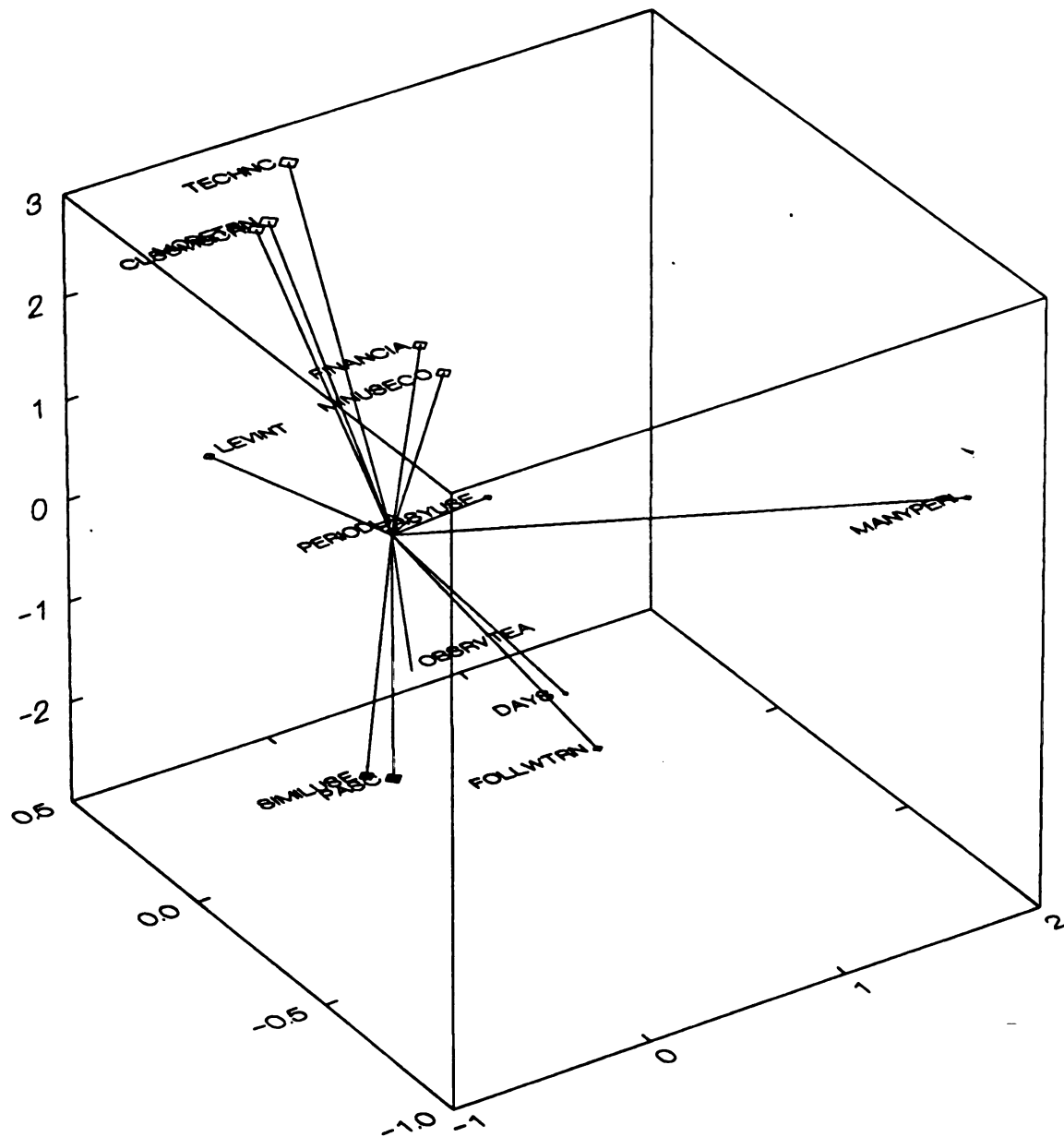


Figure 4.7 3-D Plot of Similarities Variables for Group 2

Upper Most Group

If the plot is visualized as a cube, with the origin as the center of the cube, it can be seen that variables are related to the context factors in relation to the model, such as needs that they have personal for support are found to be located at the upper most sector of the cube for both groups. These variables reflect the need for support such as more training (MORETRN), technical support (TECHNC), financial support (FINANCIA), principal support (PRINCIP), and the variables that reflect teachers' concerns such as classroom management concern (CLSSMGCR), and variable that reflects teachers' attitudes such as teachers level of interest towards the use of microcomputers (LEVINT), classroom activity such as one-way presentation (ONEWAY), discussed computer issues with other teachers (DISCOMIS), and variable related to context factors such as principal support (PRINCIP) are also found to be located at the upper most region of the cube.

This group of variables is the extreme end of a very strong response and can be seen when examining the drop-line graph in Figure 4.8. The group of variables that are located at the upper region of the cube in the plot correspond to the high average means in the drop-line graph.

Middle Group

The variables related to experience using the computers factors in the model, are found to be positioned almost around the middle of the plane for both groups. These variables reflect teachers' practices and computer usage such as the number of days teacher taught computer classes (DAYS), the

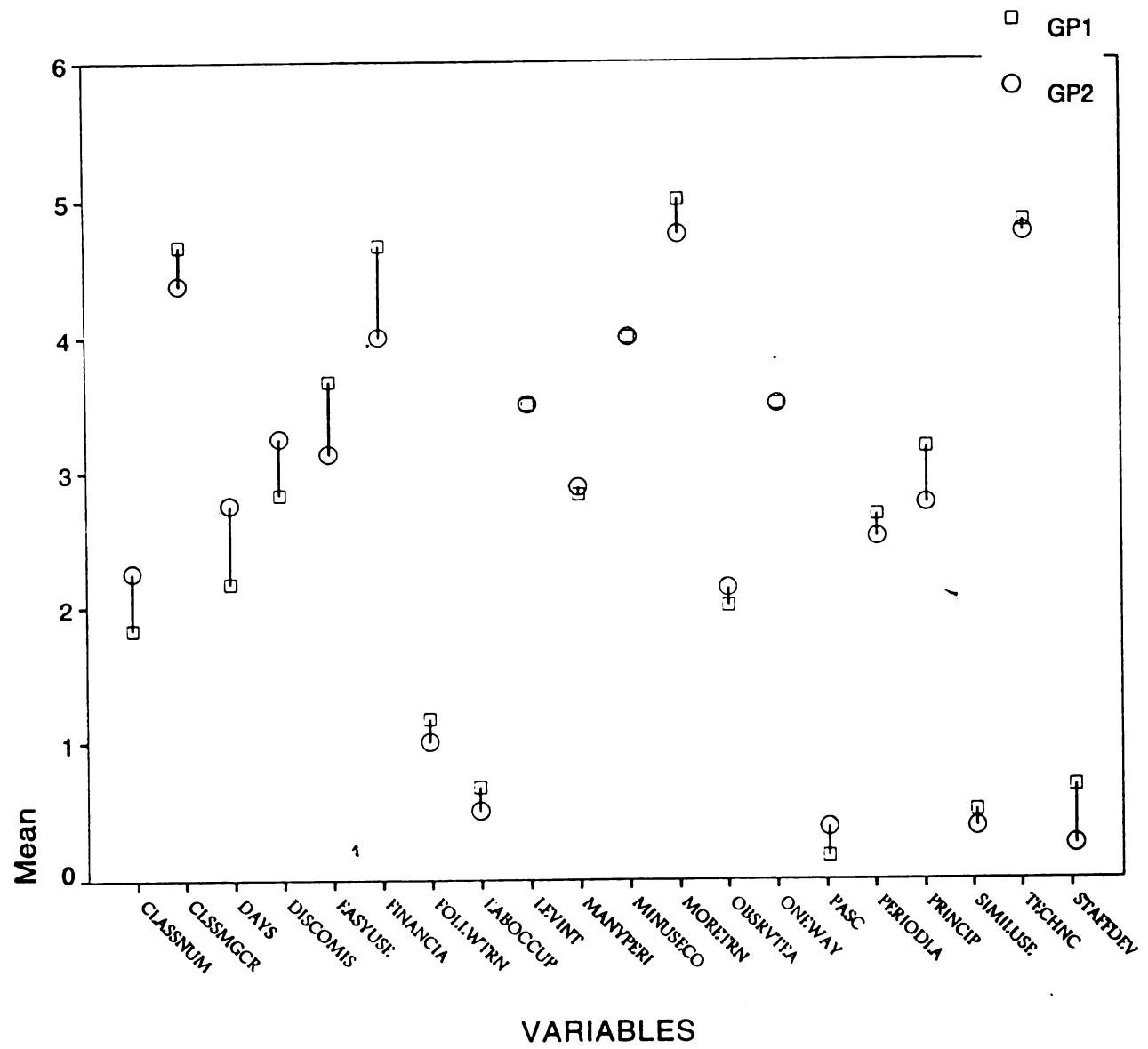


Figure 4.8 Drop-Line Graph of Similarities Variables for Groups 1 and 2

number of periods teacher used computer laboratory in a typical day (PERIODLA), number of classes taught (CLASSNUM), the number in minutes teachers used the computers (MINUSECO), activity such as one-way presentation (ONEWAY), computer is easy to use (EASYUSE), and observed other teacher teaching with computers (OBSRVTEA) are located at the middle of the cube.

This group of variables located at the middle region of the cube in the plot correspond to medium average mean in the drop-line graph.

Bottom Group

The variables that are also related to context and experience using the computers factors in the model are found to be positioned at the bottom region of the cube for both groups. These variables reflect ongoing support like follow-up training (FOLLWTRN), staff development (STAFFDEV), as well as variables that reflect the use of computer language such as PASCAL (PASC), computer laboratory always occupied (LABOCCUP), similarity in the use of computers by teachers (SIMILUSE), and too many periods given to teacher to teach (MANYPERI).

This group of variables is the extreme end of a very weak response and can be seen when examining the drop-line graph in Figure 4.8. The variables located at the lower region of the cube in the plot correspond to the low average means in the graph.

Statistics, The results of a non-parametric analysis (see Table 4.2(a), Appendix L) indicate that none of the variables selected as shown similarities between the groups showed any significance difference. This shows that both groups of teachers have very similar perceptions on these variables.

Summary of the Analyses

The results from the three analyses- plots, graphs and statistics- show that there are some variables where both groups have very similar perceptions related to the microcomputers. For examples, from plot and graph analyses, it was found that variables related context factors in the model, like variables that reflect the need for support such as more training (MORETRN), technical support (TECHNC), financial support (FINANCIA), and the variable that reflects teachers' concerns-- classroom management concern (CLSSMGCR)-- are found to be not much different for both groups. In the plot, these variables are located the upper most region of the cube which correspond to high mean averages in the graph. In other words, both groups must have similar support and concerns on the variables as stated above.

My classroom observations support the finding related to concern, such as management of a classroom. Through out my observation, in general, teachers had difficulties establishing classroom routines and organizational systems and dealing with the management aspects of teaching.

In terms of attitudes, both groups of teachers are found to show high levels of interest toward the use of microcomputers (LEVINT).

Variables related to computer usage such as similarity in the use of computers by teachers (SIMILUSE), and the variable that reflects the use of PASCAL computer language (PASC) are found to be located at the lower region of the plot which corresponds to low mean averages in the graph. This corresponds to low mean average in the graph. This implies that teachers in both groups are not very concerned about these variables.

Variables related to experience using computers factors in relation to the model, such as the number of days teachers taught computer classes (DAYS), number of classes taught (CLASSNUM), activities such as one-way presentation (ONEWAY), teachers' level of interest toward the use of computers (LEVINT), found computers easy to use (EASYUSE), and observed other teachers teaching computer classes (OBSRVTEA), are located in the middle region of the plots which corresponds to medium mean averages in the graph.

Overall, the drop-line the graph confirms that differences in the average means of all the similarities variables-- whether high, medium, or low average means-- is small.

Differences Between Groups 1 and 2

3-D Plots. A 3-D plot of differentiating variables for each group was plotted. Figure 4.9 is the 3-D plot of differentiating variables for group 1 teachers (see coordinates of the variables, Appendix M). Figure 4.10 is the

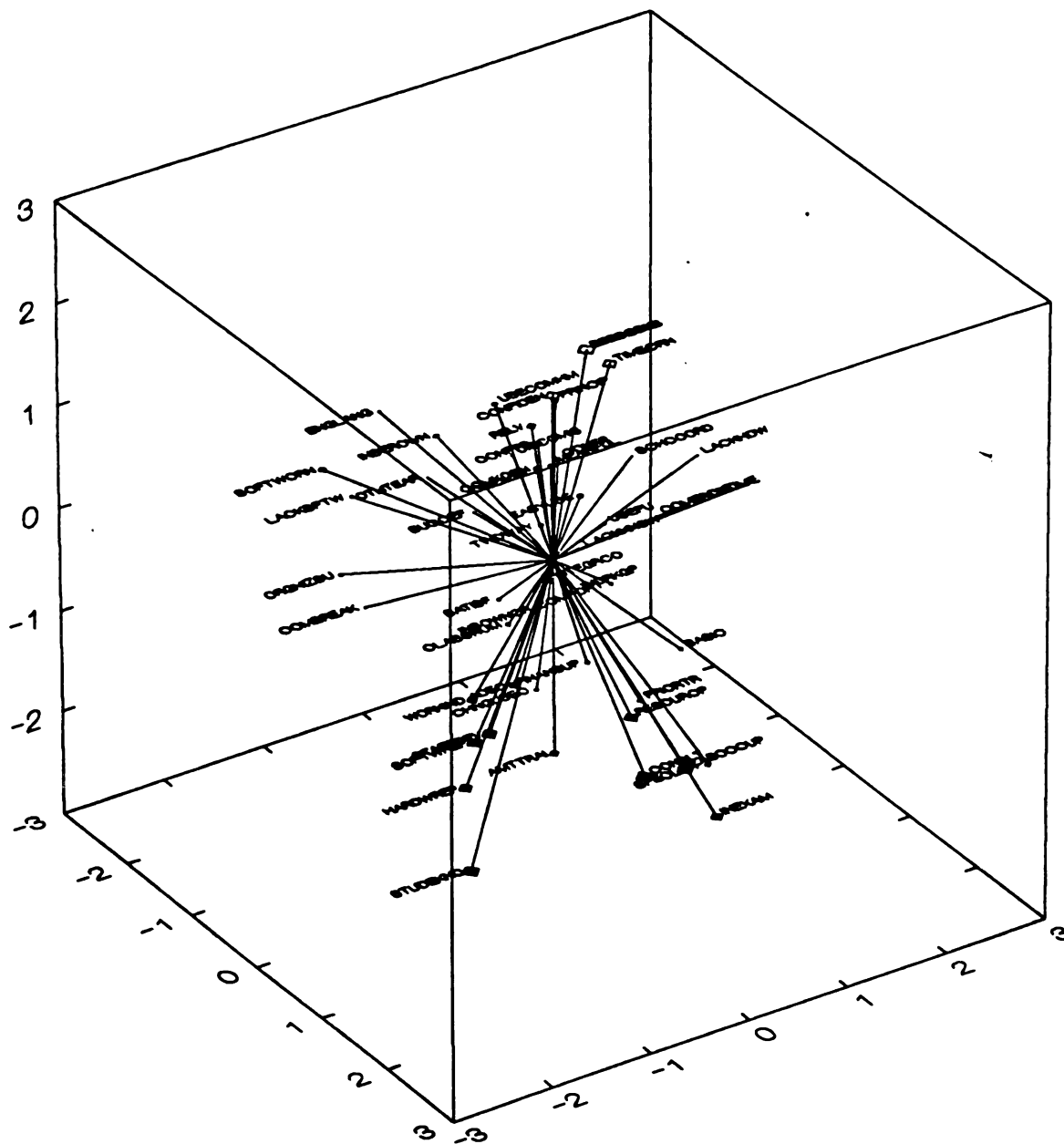


Figure 4.9 3-D Plot of Differentiating Variables for Group 1

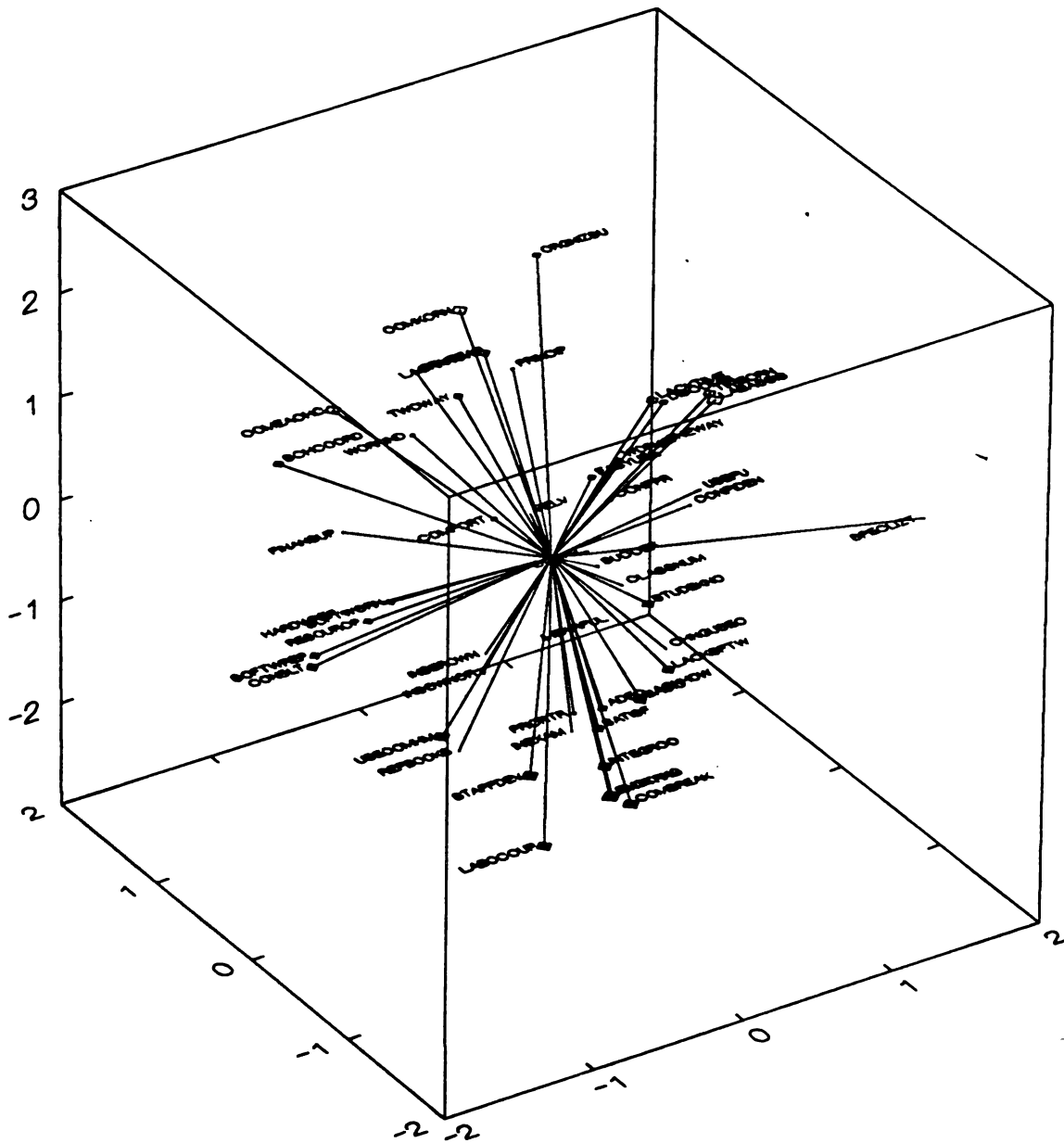


Figure 4.10 3-D Plot of Differentiating Variables for Group 2

3-D plot of differentiating variables for group 2 teachers (see coordinates of the variables, Appendix M).

Upper Most Group

The variables related to attitudes and concern factors in the model that reflect immediate teachers' needs are located at this region for group 1. These variables reflect the need for human and materials' support such as the need for lab assistance (LABASSIS), reference books related to computers (REFBOOKS), and variables that are related to attitudes such as teachers' attitudes towards the use of computers such as feeling comfortable (COMFORT) and confidence (CONFIDEN) in the use of computers, as well as variables related to concerns such as teachers' concerns such as software concerns (SOFTWCRN), lack of software (LACKSFTW), and time concerns (TIMECRN) are found to be positioned at the upper most region of the cube for group 1. But for group 2, different variables are found to be placed at this region. The variables related to concerns and experience using computer factors in relation to the model are found to be located at the upper most region of the cube for group 2. These variables reflect teachers' concerns such as computer knowledge concerns (COMKCRN), lack of knowledge on the use of microcomputers (LACKKNOW), support from the organizer (ORGNIZSU), and variables that reflect classroom activity such as two-way presentation (TWOWAY) are found to be positioned at this sector for group 2.

This group of variables is the extreme end of a very strong response and can be seen when examining the drop-line graph in Figure 4.11. The

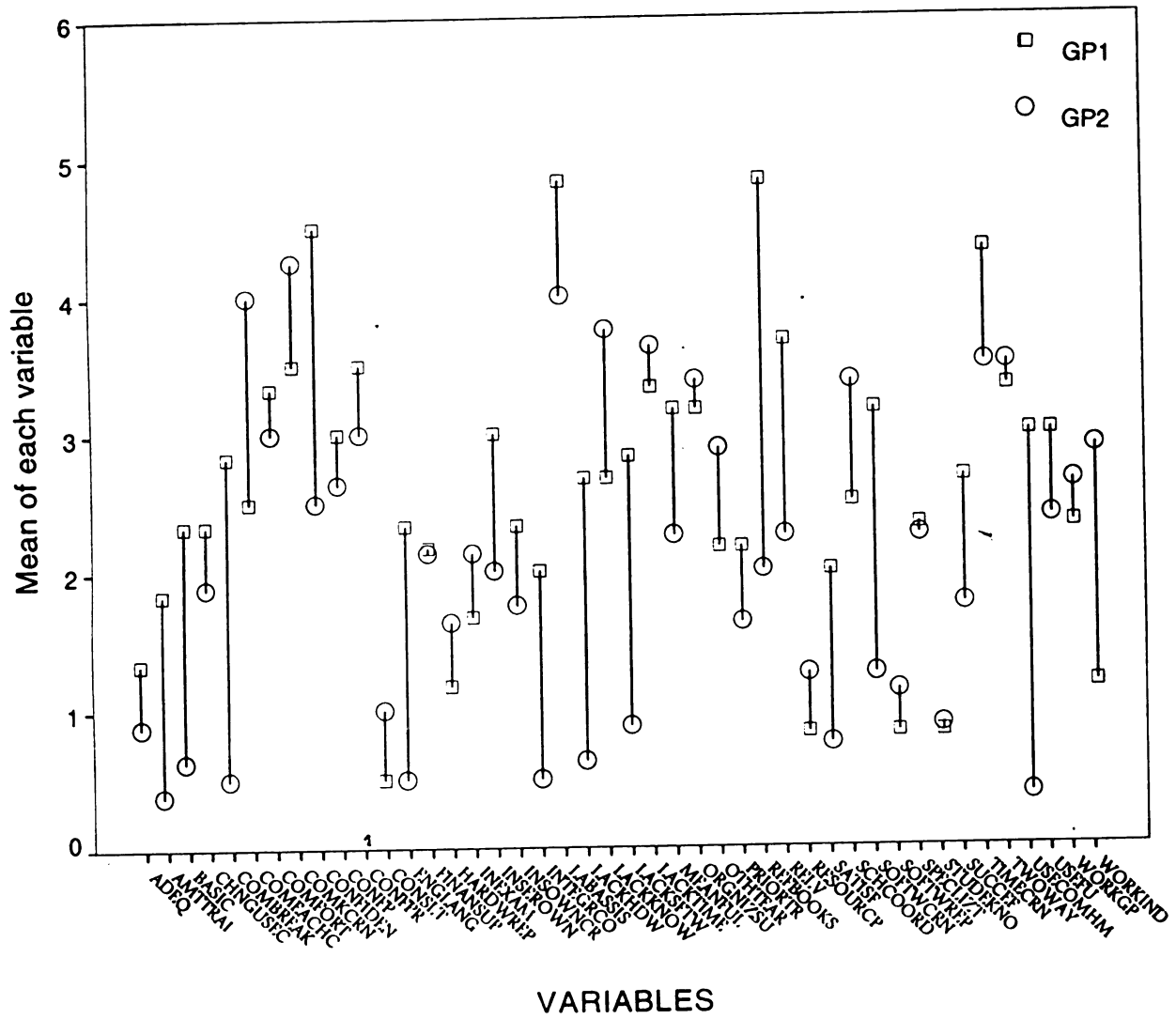


Figure 4.11 Drop-Line Graph of Differentiating Variables for Groups 1 and 2

drop-line graphs also show that the differentiating variables that are located at the upper region of the cube in the plot correspond to high average means in the graph.

Middle Group

Variables related to the context factors in the model that reflect human support like software representatives (SOFTWREP), hardware representatives (HARDWREP), computer consultants (CONSULT), and resource people (RESOURCP) are found to be clustered together at the middle left sector of the cube for group 2. For group 1, these variables are placed separately at the bottom region of the cube. For example, variables like computer consultants (CONSULT) and resource people (RESOURCP), are seen to be clustered at the bottom left sector of the cube. The software representatives (SOFTWREP) variable is placed more at the middle of the cube, and the hardware representatives (HARDWREP) variable is found to be positioned at the bottom right region of the cube.

Variables related to context factors in the model, that reflect technical problem such as computer breakdown (COMBREAK) and lack of software (LACKSFTW) are found to be clustered at the far right sector of the cube for group 1, but for group 2 these variables are positioned at the bottom far left and right end of the cube.

Examining the drop-line graph in Figure 4.11, it can be seen that the differentiating variables that are located at the middle region of the cube in the plot corresponding to medium average means in the graph.

The results suggest that these two groups have different perspectives related to uses of microcomputers in their teaching with respect to the variables as stated above.

Bottom Group

If we compare these two plots and, again, if the plot is visualized as a cube with the origin as the center of the cube, variables related to experience using the computers factor in relation to the model, such as use of computers prior to training (PRIORTR), computer usage at home (USECOMHM), amount of training received (AMTTTRAI), changes in the use of computers after training (CHNGUSEC), and the use of programming language like Basic (BASIC), and are positioned around the bottom right region of the cube for group 1. But in group 2 these variables are placed more at the bottom left region of the cube.

This group of variables is the extreme end of the weak response and can be seen when examining the drop-line graph in Figure 4.11. The group of variables located at the bottom region of the cube in the plot correspond to low average mean in the drop-line graph.

Statistics. Another way to look at the same data is to use a nonparametric Mann-Whitney Use test. The purpose is to look at the distribution of each of the variables between the two groups. The Mann-Whitney test was computed across the 64 variables. The results of the test show variables that are statistically significant and variables with the value of $p < 0.15$ and are shown in Table 4.2(a). The remaining results of

the test with variables that show the value of $p > 0.15$ are listed in the Appendix L. The results of the analyses indicated that most of the differentiating variables located in the upper region of the plot are statistically significant or very close to significant between the two groups . There are exceptional cases where variables such as lack of knowledge on the use of computers (LACKKNOW), record-keeping (RECDKEEP), and students working individually (WORKIND) are found to be located at different region of the plot. This may due to the small sample size used in the study. Out of 64 variables, 8 variables were found to be statistically significant. The significant difference shows that both groups were perceived differently on these variables.

Summary of the Analyses

Concerning variables related to background characteristic factors in the model, it was found that teachers in group 1 were more experienced in the use of the microcomputers in their teaching. They attended more in-service training and had used computers prior to the training, at work and at home. They perceived themselves to be knowledgeable on the use of the microcomputers in their practice. This group also used BASIC programming language more frequently than teachers in group 2. These variables related to background characteristics show large differences in the distribution between the two groups.

For variables related to context factors in the model, such as support, the results of all the three analyses are found to be very supportive.

Table 4.2(a)

Nonparametric-Mann-Whitney Test of the 64 Variables
Between Group 1 and Group 2

<u>Variable</u>	<u>Mean Rank</u>		<u>Z value</u>	<u>p value</u>
	Group 1 (n = 7)	Group 2 (n = 7)		
BASIC	9.36	5.64	-1.7269	.0842
USECOMHM	9.64	5.36	-2.1283	.0333**
AMTTRAI	9.00	6.00	-1.5659	.1174
CONFPR	8.86	6.14	-1.4232	.1547
SATISF	9.93	5.07	-2.4153	.0157**
MEANFUL	9.50	5.50	-1.8731	.0611
ADEQ	8.86	6.14	-1.6927	.0905
RELV	9.86	5.14	-2.3380	.0194**
FINANCIA	9.43	5.57	-1.8752	.0605
LABASSIS	9.07	5.93	-1.6630	.0963
REFBOOKS	10.86	4.14	-3.1788	.0015**
LACKKNOW	5.29	9.71	-2.1700	.0300**
COMBREAK	9.07	5.93	-1.6429	.1004
LABOCCUP	8.50	6.50	-1.4720	.1410
COMKCRN	5.79	9.21	-1.6252	.1041
INTEGRCO	9.14	5.86	-1.5892	.1120
CONFIDEN	10.14	4.86	-2.4516	.0142**
RECDKEEP	5.92	9.71	-2.0255	.0428**
MICROWL	5.71	9.29	-1.7523	.0797
WORKIND	4.43	10.57	-2.8492	.0044**

**variables that are statistically significant, $p < 0.05$

Teachers in group 1 want more ongoing, follow-up training for staff development and materials' support such as reference books and teaching-learning materials. But group 2 teachers want more human support such as help from computer experts from the outside on the use of the microcomputers.

Variables related to attitudes and concerns factors in relation to the model and the results from the plots, graphs, and statistics are found to be very consistent.

Teachers in group 1 felt very comfortable and confident in using microcomputers in their teaching in comparison to teachers in group 2. They felt it was easy to use computers in their practices.

For ariables related to concerns, teachers in group 1 were concerned with availability and access problems such as lack of hardware, financial, materials support, follow-up training and computer failure. Teachers in group 2 were more concerned with their lack of computer knowledge and seeking help from computer experts on the use of microcomputers.

In terms of level of computer usage, it was found that results from plots, graphs, and statistics analyses indicated that teachers in group 1 used application types of software such as wordprocessing, spreadsheets, databases and programming language such as BASIC. Teachers in group 2 used more instructional software like tutorial, drill and practice, game-like drill and computer instruction programs that are more content-specific.

The drop-line graphs in Figure 4.11 confirm that the differentiating variables between the groups show a considerably large difference in the mean average between the two groups. But some variables like financial support (FINANSUP), students' computer knowledge (STUDEKNO), activity such as two-way presentation (TWOWAY), and specialized computer teachers (SPECLIZT) are found to show very small differences between group 1 and group 2 in the graph. This is because the drop-line graph used the mean of the variables; but when plotted in the 3-D graph, these variables were found to be placed at the different region of the cube. This implies that teachers in both groups have different perspectives on these variables.

Summary of Group Similarities and Differences

The results of the plots, graphs, and statistics show that there are similarities in some of the variables (Figures 4.6 and 4.7) between the two groups. There are variables where both groups of teachers shared common interests and concerns. Variables related to context factors in relation to the model, such as the need for support such as technical, financial, and principal assistance, and need for more training, were found to be the greatest concern for both groups. These variables are located at the upper region of the cube in the plot which correspond to high mean average in the graph. Variables that reflect the use of computer language such as PASCAL (PASC) were found to be in very limited use by both groups.

Variables that reflect wanting more knowledge related to the use of computers such as follow-up training and staff development were perceived by both groups to be not taken seriously by the organizer. Variables like hiring a teacher specialized in computer education to teach computer subjects, and whether the teachers were using computers in a similar way, were found to be of least concern to the two groups.

For variables related to attitudes, practices, and computer usage, the analyses show that there are some variables found to be closely similar between the two groups. These variables that are related to experience using computers in relation to the model are found to be located at the center of the cube in the plot. In the graph these variables show very little difference between the two groups. For examples from the analyses, both groups were shown to have very high levels of interest toward the use of microcomputers. Both groups seem to chose most often a one-way presentation approach to teach students. Both groups had almost the same number of classes, number of days, and periods in teaching with computers.

The analyses also show that there are differences between the two groups. For variables related to context factors in relation to the model, such as support, group 1 leaned more towards the need for technical support, while group 2 leaned more towards the need for human support. For example, the variables like software representatives (SOFTWREP), hardware representatives (HARDWREP), computer consultants (CONSULT), and resource persons (RESOURCP) were found to be the external support

needed by group 2 teachers. But for group 1, these variables were not the main support needed. Instead, group 1 leaned toward variables related to context that were more directed to availability and access problems, such as computer breakdowns (COMBREAK), software concerns (SOFTWCRN), lack of software (LACKSFTW), and hardware (LACKHDW).

Through my own observations, computer breakdowns was found to be one of common problems for teachers. In every teaching session, teachers were always faced with computer failure such as the keyboards not functioning, the computers suddenly "freezing," trackballs not working and sometimes monitors seeming not function well. Below are the problems reported by teachers to the state education ministry. Through out my own observation, the problems caused by the machines were much worse than what was reported by the teachers.

Variables related to concerns, such as those reflecting the need for teaching-learning materials and reference books that are related to the use of microcomputers (REFBOOKS), concern about time to use computers (TIMECRN), and lab assistance (LABASSIS), were found to be the highest concern for group 1 teachers. On the other hand, group 2 teachers seem to be very highly concerned about their lack of knowledge about computers. From the analyses, the variables that reflect teachers' concern such as computer knowledge concerns (COMKCRN) and lack of knowledge (LACKKNOW) were found to be the variables that effect group 2 teachers'

using microcomputers in their practice. Group 2 teachers must have felt that they did not have adequate knowledge on the use of microcomputers.

Table 4.3

Problems of Hardware and Software Reported (from May, 1994 to August, 1994) by the Schools to the State Education Ministry.

	School B	School C	School D	School E
No. of Trackball not functioning	2	2	5	2
Number of monitor not working	-	2	1	1
Printer	1	1	-	-
Server/Workst	Too slow	Too slow	Too Slow	Too Slow
Keyboard	1	4	3	1
Software	LanSmart Lotus 123	-	Power Basic WPerfect	DOS

(*School A report of hardware and software problems was not found in the state education file)

The analyses show that group 2 teachers searched for expert help from the outside, due to their lack of knowledge on the use of microcomputers in their teaching.

For variables related to experience using the computers in relation to the model, the analyses show that group 1 teachers used more application software such as Dbase, spreadsheet, wordprocessing and programming language such as BASIC, while group 2 teachers used more instructional software such as tutorial, drill-and-practice, and computer instruction which was related to specific content. These results suggest that there are differences in perception in the use of microcomputers between these two groups of teachers with respect to the variables as stated above.

TEACHERS' ATTITUDES

Attitude Clusters

The previous section deals with perceptions, but there are other groups of variables like attitude that were not measured in the same way, could not be included in the previous analyses, and had to be treated separately. For the attitude variables, I am going to see whether there is a difference between the groups.

The results of the simple analysis show that there is a correlation between teachers' attitudes and the dependent variables, that is, the observed and perceived level of use does not show any relationship. The distribution of the observed and perceived table shows that the teachers' levels of interest towards the use of computers was less when compared with

their levels of use between groups. This is possibly due to the poor support provided to teachers by the organizer and administrator and the problems faced by these teachers, specifically the technical problems found when using computers that decrease teachers' levels of interest.

To look at the overall analysis of teachers' attitudes toward the use of microcomputers using distance analysis, the 20 variables by 14 case matrix was formed into a 20 x 20 matrix and entered into the SPSS where an MDS was computed. The coordinates for the 3-D from the MDS were exported and put into a 3-D graphing selection of the Systat to produce a plot. To look at attitudes for each group, the 20 x 14 matrix were split into two 20 x 7 matrices, one for each group. The MDS was computed, and the 3-D-graph was plotted for each group. When interpreting attitude data, one must remember that negatively worded attitudes' statements were reflected and scored in the opposite direction (see Appendix G for the reflected statements).

Results of the 3-D plots did not show any clear clusters because attitude statements are basically a set of questions dealing only with amount of positive affect and negative affect. The attitudes scale are fundamentally one dimension. Since the plot did not give any interesting result, to analyze teachers' attitudes between the groups, I formed scores for group 1 and group 2. The score was added and a non-parametric, Kruskal-Wallis one-way analysis of variance was used to see whether group 1 was more positive or negative than group 2.

The result of the test (see Table 4.6) show very minor differences between the two groups. It was found that group 1 teachers had a higher rank sum (60.00) in comparison to group 2 teachers (45.00). The result

suggests that teachers in group 1 react more positively toward the use of microcomputers in their classroom instruction than do teachers in group 2. The more positive attitudes reflected in group 1 seem to agree this group of teachers' knowledge on the use of computers in their teaching, and their more extensive use of computers in comparison to teachers in group 2. Teachers in group 1 used different approaches to the use of microcomputers and used more application software programs in their practice in comparison to group 2 teachers, who used more instructional programs.

Table 4.6

Kruskal-Wallis One-Way Analysis Of Variance For 14 Cases¹

Group	Count	Rank Sum
1.000	7	60.000
2.000	7	45.000

Mann-Whitney U Test Statistic =	32.000
Probability Is	0.334

Perceived Barriers

Clusters of Perceived Barriers

The results of the simple analysis show that the correlation between barriers and the dependent variables, that is observed and perceived levels of use, show that there is a moderately positive relationship between the observed level of use with the past barriers. This indicates that in the past teachers were faced with many different kinds of barriers concerning the use of computers. This was possibly due to their lack of computer knowledge which may be caused by a lack of training at the initial phase. The correlation between the present barriers and the observed and perceived level of use does not show any relationships.

The barriers based on distance analysis gave a very interesting result. To look at the overall analysis of the perceived barriers, the 30 variables by 14 case matrix was formed into a 30 x 30 matrix and was entered into the SPSS where a MDS was computed. The coordinates for the 3-D from the MDS were exported and into the 3-D graphing selection of the Systat to produce a plot. To look for barriers over time and groups, the 30 x 14 matrix was split into two 30 x 7 matrices, one for each group. The MDS was computed, and a 3-D graph was plotted for each group.

Combined Analyses

In the 3-D plot, each abbreviation used to represent each barrier that ends with the letter 'p' indicates a response for present barrier. Each

abbreviation that does not end with the letter 'p' is the response for the past barrier. The full statements of the barriers are listed in Appendix N, and the abbreviations are listed on page x.

Figure 4.12 is the 3-D plot of the barriers for all teachers (see coordinates of barriers in Appendix K). From the plot was found, a shift of all of the barriers, generally in the same direction but varying in magnitudes. Some barriers show a great shift over time. For example, barriers that reflect availability and access of hardware and software such as "too few printers or other peripherals" (FEWPRIPE-FEWPRIPP), "the lack of quality software" (LACQUASF-LACQUASP), "too few computers for the number of children" (FEWCOMST-FEWCOMSP), and barriers that reflect support and teacher's confident such as "lack of encouragement from administration" (LACENCOU-LACENCOP), "I am not confident with computers" (NOTCONFC-NOTCONFP), and "my own knowledge of computers is still too weak" (OWNKWEAK-OWNKWEAP) were found to show a great shift over time. Barriers that reflect lack of time such as "problems scheduling enough computer time for different teachers' classes" (PROBSCHE-PROBSCHP) and "too little time given for teachers to learn how to use computers" (LITTIMLE-LITTIMLP), were also found to show a big shift over time.

From the plot it was found that some barriers that show a small shift over time. For example, barriers that reflect lack of support such as "lack of follow-up in-service training" (LACKFOLLT-LACKFOLLP), "inadequate financial support for computers from the school and/or district" (INAFINSU-INAFINSP), "there is lack of funding for software "

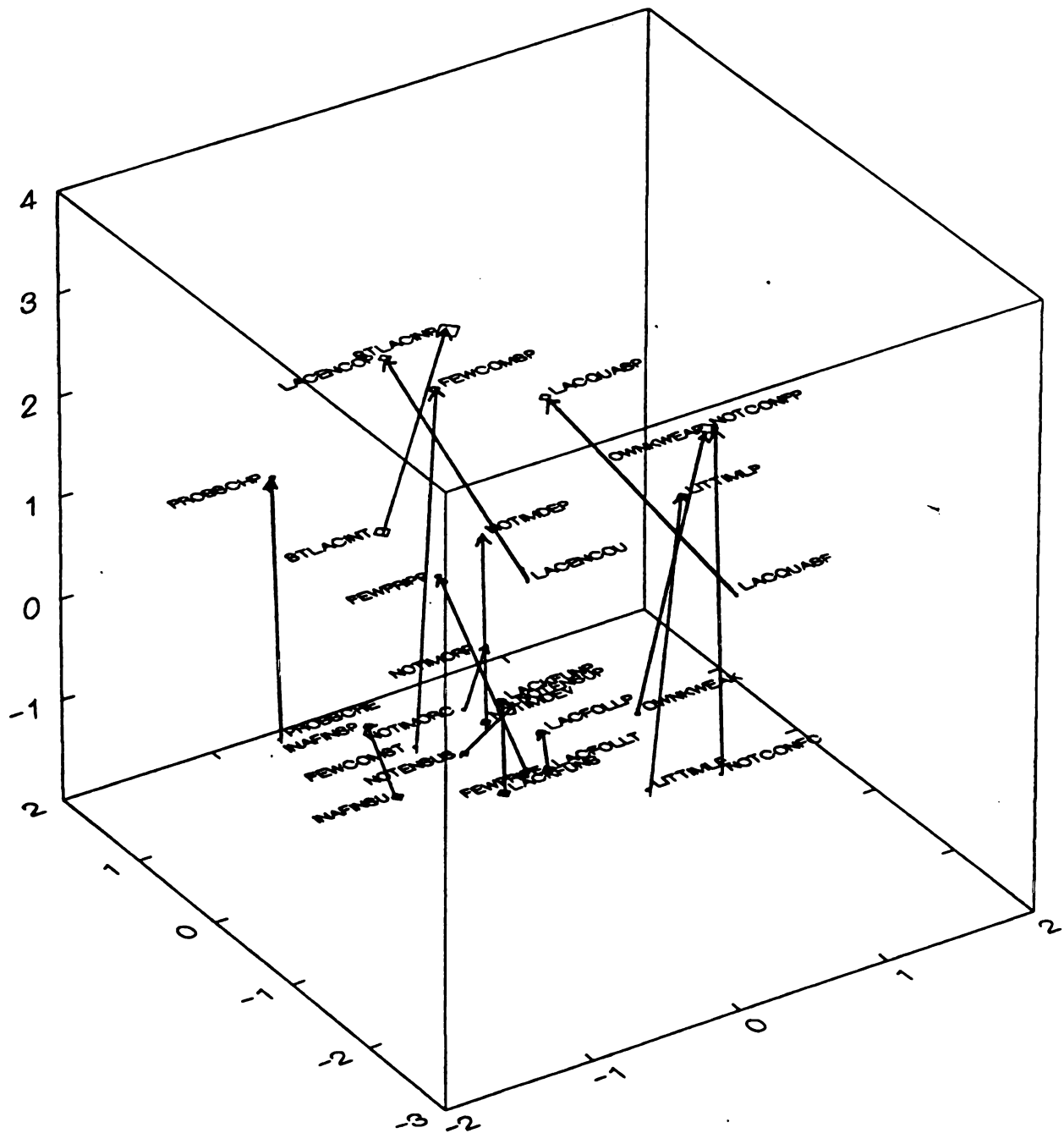


Figure 4.12 3-D Plot of Barriers for All Teachers

(LACKFUNS-LACKFUNP), "not enough time in the school schedule for more computer-based instruction" (NOTIMORC-NOTIMORP), and "not enough help for supervising student computer use" (NOTENSUS-NOTENSUP) were found to show a small shift from the past to the present.

In the overall analysis, I cannot quite figure out why there were a big shift and a small shift in the barriers. The analysis did not give any clear pictures, but it showed generally a consistent shift in one direction, that is, from bottom to up, some are larger than others.

Group Similarities

3-D plots of barriers for group 1 and group 2 were drawn. Figure 4.13 is the 3-D plot of past and present barriers for group 1 teachers (see coordinates of the barriers in Appendix K). Figure 4.14 is the 3-D plot of past and present barriers for group 2 teachers (see coordinates of the barriers in Appendix K). If we were to examine Figures 4.13 and 4.14 very carefully, we could see that barriers that reflect teachers' confidence and support such as "I am not confident with computers" (NOTCONFC-NOTCONFP), "lack of encouragement from administration" (LACENCOU-LACENCOP), barriers that reflect lack of facilities such as "too few computers for the number of children" (FEWCOMST-FEWCOMSP) and "the lack of quality software" (LACQUASF-LACQUASP), and barriers that reflect lack of time such as "there is not enough time to develop lessons that use computers" (NOTIMDEV-NOTIMDEP) show a big shift from the past to the present. In other words, these barriers that were perceived by both groups to be a considerable barriers in the past were much smaller barriers.

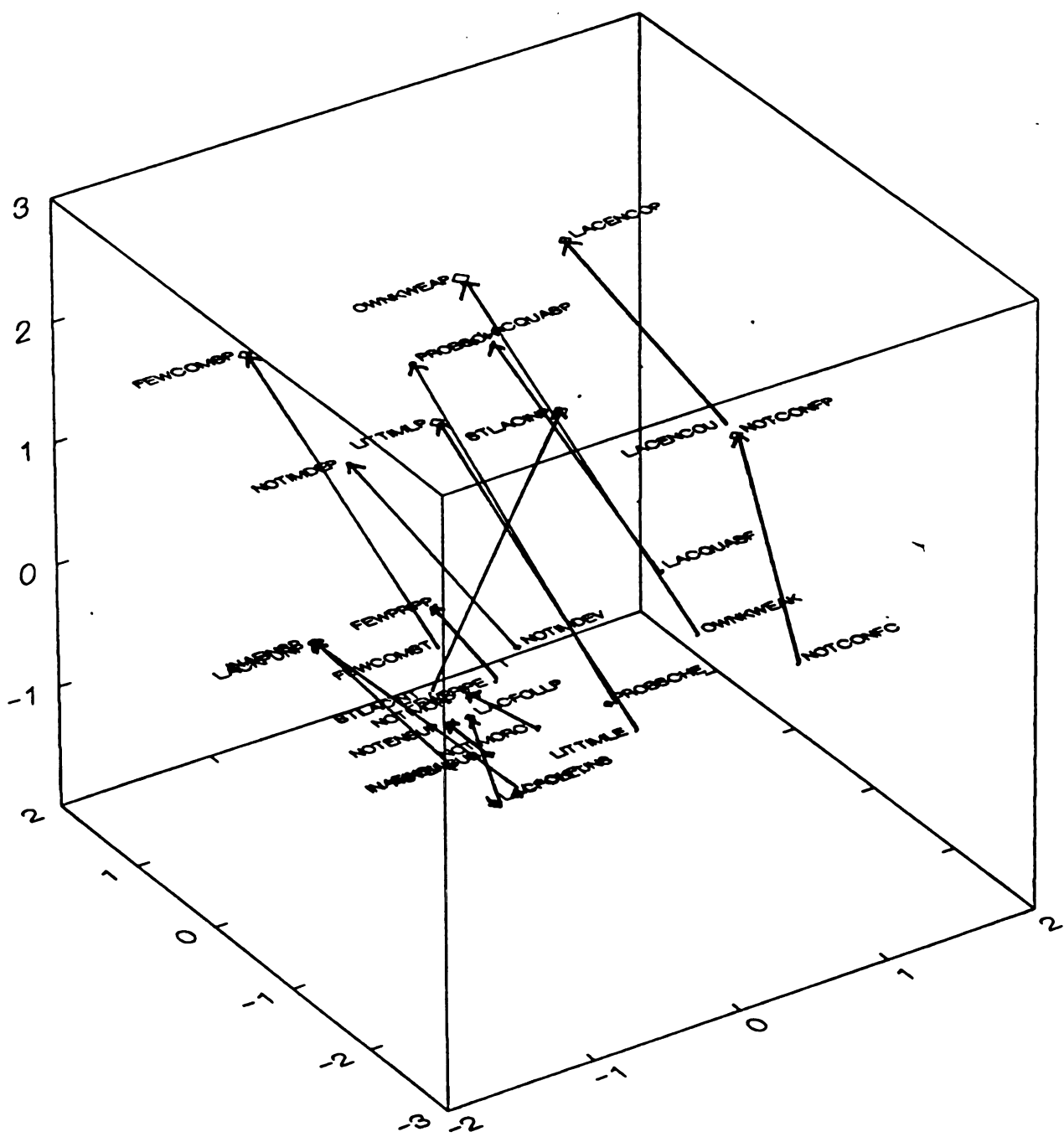


Figure 4.13 3-D Plot of Barriers for group 1

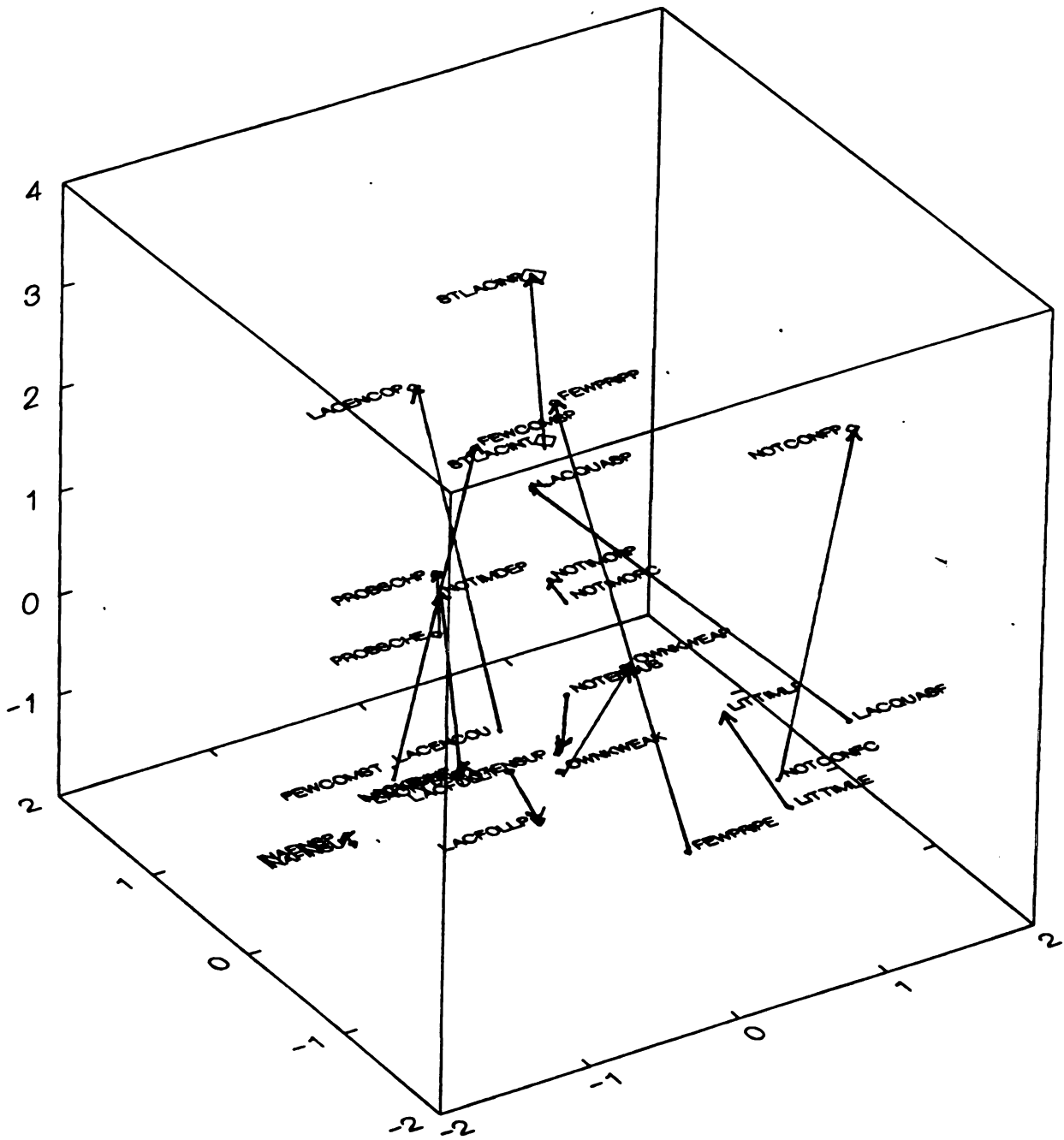


Figure 4.14 3-D Plot of Barriers for group 2

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This result suggests that as these teachers gain confidence in the use of computers, whether there is support from administrators or not, it does not matter to them anymore. Not enough time to develop lessons that use computers was not a barrier now as teachers became more confident and comfortable with using computers to teach. Lack of quality software and computers are no longer considered to be a barrier now because they were being provided by the education ministry.

Barriers that show lack of financial and human support such as "lack of follow-up in-service training" (LACKFOLLT-LACKFOLLP), "inadequate financial support for computers from the school and/or district" (INAFINSU-INAFINSP), "there is lack of funding for software" (LACKFUNS-LACKFUNP), "not enough time in the school schedule for more computer-based instruction" (NOTIMORC-NOTIMORP), and "not enough help for supervising student computer use" (NOTENSUS-NOTENSUP) were found to show a small shift from the past to the present for both the groups.

The results suggest that administrative barriers were found to be not much reduced in the past or in the present. These administrative barriers that were considered as major barriers in the past remain as major barriers now. This suggests that teachers in both groups perceived that not much action has been taken on these barriers by the people at higher levels.

Group Differences

If we were to examine Figures 4.13 and 4.14 very carefully, the 3-D graph for group 1 shows that the shift of barriers over time was large and generally more in the same direction. In the 3-D graph for group 2, the shift

of the barriers over time was more scattered and there was some shift in the opposite direction. These results indicate that for group 1 the barriers were lessening measurable; they present a very clear picture in the plot. For group 2, are bit fuzzy; the plot shows some barriers still remains the same over time.

If we were to compare Figures' 4.13 and 4.14, we can see that some barriers show a big shift for teachers in group 1, but the same barriers show a small shift for teachers in group 2. For example, barriers that reflect teachers' computer knowledge and lack of time such as "my own knowledge of computers is still too weak" (OWNKWEAK-OWNKWEAP), "problems scheduling enough computer time for different teachers' classes" (PROBSCHE-PROBSCHP), and "too little time given for teachers to learn how to use computers" (LITTIMLE-LITTIMLP) were found to show a great shift for group 1 teachers; but for group 2 teachers, these barriers show only a small shift.

The results suggest that lack of computer knowledge is no longer a barrier for group 1 teachers (see appendix K for averages of past and present barriers). They perceived themselves now to have adequate knowledge on the use of computers. In contrast, even though group 2 teachers they claimed that they were confident now in using computers, they perceived that their own knowledge of computers was still weak in the past and is still so in the present. Lack of computer knowledge is still a major barrier for teachers in this group.

Group 1 teachers believe there has been progress in reducing the barrier that reflects lack of time to learn such as "too little time given for

teachers to learn how to use computers" (LITTIMLE-LITTIMLP). In contrast, group 2 teachers, still believe that they are not given enough time to learn how to use of computers in the present as they were in the past. This result is related to their lack of knowledge the computers, because they claimed that they were not given enough training and adequate time to master the computers. As for the barrier that reflects students' interest such as "lack of student interest" (STLACINT-STLACINP), group 1 teachers perceived there was a tremendous change in students' interest to learn in the past and in the present. Group 2 teachers, perceived that there was not much change in their students' interest to learn. This result suggested that teachers in group 1, who are more knowledgeable in the use of computers, used many different approaches to teach their students, and this might increase students' interest to learn. As for teachers in group 2, who are less knowledgeable on how to use computers, they did not use a variety of approaches to teach their students, so there were not many changes in their students' interest to learn.

Barriers that reflects lack of facilities such as "too few printers or other peripherals" (FEWPRIFE-FEWPRIPP) were found to show a small shift for group 1 teachers, but for group 2 teachers this barrier shows a big shift from the past to the present. This result suggested that teachers in group 1, who are knowledgeable in the use of computers, had been using printers and other peripherals in their teaching in the past and in the present. Even though they are provided with additional equipment in the present, they still find that it is not sufficient. On the other hand, group 2 teachers who are less knowledgeable in the use of computers, might use only very few printers

and other peripherals or may be none at all. To these teachers, in the past there was very limited access to this equipment, but now they are given more of these equipment. The presence of more of this equipment for them does not mean much if they do not use it.

Summary of Group Similarities and Differences

The 3-D plots show that there are differences in the perceptions of past and present barriers between the two groups. In terms of teachers' backgrounds characteristics in relation to the model, the finding was very similar to the results of the analyses of plots, graphs and statistics. Teachers in group 1 perceived they had adequate computer knowledge on the use of microcomputers. This finding was clearly shown when the barrier that reflects teachers' computer knowledge shows a big shift over time for group 1 teachers, but for group 2 the same barrier shows only a small shift over time.

In terms of context factors in relation to the model, such as training and time to learn to use microcomputers, group 1 teachers perceive that they were given enough time to learn to use microcomputers in their practice since group 1 teachers had attended many training. In contrast, group 2 teachers, claimed they were not given enough training and adequate time to master the computers. This is reflected in the response given on the barrier that was related to "too little time given for teachers to learn how to use computers." The above result can be related to lack of computer knowledge for group 2 teachers. Results from the plots and graphs and statistics analyses support the above finding.

In terms of experience using computers in relation to the model, teachers in group 1 who are more knowledgeable perceived that they used many different approaches to teach students, which increased students' interest to learn. This result was reflected in the response given to the barrier that was related to lack of students' interest. Group 1 perceived that there was a great change in students' interest over time. In contrast to group 2, they perceived there was not much change in students' interest to learn. This result can be related to lack of teachers knowledge on the use of microcomputers; thus teachers in group 2 did not use a variety of approaches to teach their students, so there were not many changes in their students' interest to learn.

The above finding can be related to the results of the plots and graphs where teachers in group 1 used more application software programs that allow students to be creative, in comparison to groups 2 teachers who used more instructional software programs which are more content specific.

The plots also show that there were similarities in the perception of past and present barriers between the two groups. In terms of context factors in relation to the model such as support, the barriers that reflect financial and human support were found to show only a small shift for both groups. These results suggest that both groups perceived administrative barriers to be not much different in the past or in the present. Barriers that reflect teachers' confidence and lack of facilities and time to prepare lessons show a big shift over time. These barriers that were perceived by both groups to be a considerable barrier in the past are much less of a barrier now.

Overall, in general, these teachers rated barriers as less problematic in the present than in the past. They believed that there has been progress in reducing some of these barriers. For example, teachers' lack of confidence in using computers and weak knowledge of computers was seen to be a major barriers in the past, whereas now these were much less so. However, there were some major barriers in the past that remain as major barriers now. For example, administrative barriers that related to the context factors in relation to the model, such as lack of follow-up in-service training, inadequate financial support, lack of funding for software, and not enough help for supervising computer use, remain as major barriers in the present as they were in the past. The results from the 3-D plot and the drop-line graph confirmed the above findings. Teachers in both groups perceived that there was not much on-going, follow-up, in-service training, and there was lack of financial support either from the school or district.

Although many of these teachers were highly motivated in the use of computers in their classrooms, they experienced significant barriers on the use of computers. The responses given by the teachers enabled me to compare teachers' current judgments about the barriers over time.

Research Questions and Hypotheses Testing

In this study the correlation among the variables was computed to look for any simple relationships. To look at the more complex relationships of the variables, a 3-D visual display and a drop-line graph of the variables were used. A nonparametric analysis, Mann-Whitney Use test was used to

look at the distribution of each variable between the groups. The results from the analyses were used to answer and discuss the research questions and to examine the hypotheses. The next section is a discussion of research questions and hypotheses.

General Context

What types of support are provided to the teachers?

Based on the data collected and from my observation sessions, it was found that teachers were provided with the same hardware and software , and were given training on the use of the microcomputers.

The software programs were provided include wordprocessing, spreadsheet, database, drawperfect, DOS, and BASIC only. Teachers perceived that software programs provided by the government were very limited.

Training on the use of computers were also provided by the government. Results from the plot, graph, and statistics (see Figures 4.9, and Table 4.2), show that group 1 teachers perceived themselves to have adequate knowledge on computers had attended many in-service training sessions provided by the organizer (see Tables 4.1 and 4.2) and felt that the training provided was relevant, useful, meaningful, and satisfactory (see Figures 4.9, and Table 4.2). Even though group 1 teachers had attended more training than group 2 teachers, they were asking for more training.

In contrast to group 1, group 2 teachers felt that they were not given enough in-service training on the computer. This was reflected by their lack of knowledge and their great concern for computer knowledge. From my interviews, teachers in group 1 reported that they had not followed the training provided by the organizer from the beginning when this project was first launched. They attended training at the second phase of the project. The training given at the second phase at higher level (i.e., enrichment courses). From the interviews, Group 2 felt that the training that they had attended was not relevant, not meaningful, not successful, and not satisfactory. This was mainly due to their lack of computer knowledge and the fact that they could not follow the course given to them. They strongly felt that the courses that they attended were not for their level. Group 2 teachers were asking for more in-service training from the government.

The results show that both groups want more training (see Figures 4.6, 4.7), but each group focuses on different areas. From the interviews, group 2 teachers would like more training on the basic level. Group 1 teachers would like more training on how to solve technical problems caused by the machines. Overall, the results of the analyses indicate that both groups had perceived that they were not provided with enough training in the use of computers for teaching.

In relation to the model, context factors such as support in terms of technical or financial issues and training that were provided to the teachers were found to be closely related to the way they used the computers.

The tentative hypotheses related to context are the following.

- (a) The amount of training is negatively related to the barriers teacher faced when using the computers. (SUPPORTIVE)

The data collected were consistent with the above hypothesis. The results indicate that as teachers gained more knowledge on the use of computers from attending more training, the fewer barriers were faced by them when using the computers.

- (b) The amount of training teachers had is positively related to the degree of computer integration in their subject matters. (SUPPORTIVE)

The data collected were consistent with the above hypothesis. The results indicate that as teachers gained more knowledge on the use of computers from attending more training, they tried to integrate computers into other subjects.

The tentative hypotheses related to dependent variables are the following.

- (a) The support provided for a teacher is positively related to the level of use of computers. (OPPOSITE)

The data were inconsistent with the above hypothesis. Teachers perceived that the support provided for them decreases with their level of using computers. In other words, the more they used the computers the less the support provided to them.

- (b) The training which is adapted to teacher's concerns and needs is positively related to degree of current computer usage. (SUPPORTIVE)

The data collected were consistent with the above hypothesis. The results indicated that the more training teachers had that was related to their own practice, the more they used the computers.

Teacher Background Characteristics

It is possible to differentiate teachers into groups?

From intensive analysis using a distance matrix, it was found that teachers can be differentiated into two distinct groups. These groups can be differentiated based on their background characteristics. The results of the simple analysis show that teachers can be grouped based on their knowledge of computers, teaching experience, experience teaching with microcomputers, age, amount of training attended, and extent of microcomputer usage. The results of the analysis show that group 1 teachers perceived that they had adequate computer knowledge and were confident in the use of computers in their teaching (see Figure 4.9 and Table 4.2(a)). This group perceived that

they were well prepared to teach with the computers. On the contrary, group 2 teachers who perceived themselves to be lacking of computer knowledge felt very insecure, inadequate, under prepared, and less confident in using computers in their teaching. Due to their lack of confidence in the use of microcomputers, these teachers were asking for more help in the use of computers from the outside (see Figure 4.10).

The analyses show that teachers' background characteristics are very important and strongly associated with the way they use microcomputers. Results from analysis indicate that group 1 teachers who were more knowledgeable in computers used computers more at a technical level. They used more application software like spreadsheets, database, wordprocessing, and graphing (see Figure 4.9 and Table 4.2). This group of teachers also made an effort to integrate computers into their teaching of other subjects. Group 2 teachers tend to use more instructional software like tutorial, drill-and-practice, games, and computer instruction programs (see Figures 4.10 and 4.11). This software is much easier to use and is more user "friendly."

In relation to the model, background characteristic factors were found to be very important variables that associate with the way teachers use computers in their classroom instruction.

The tentative hypotheses that are related to background characteristics are the following.

- (a) Teachers' teaching experience was positively related to their concerns on the use of computers. (OPPOSITE)

The data were inconsistent with the above hypothesis. It was found that teaching experience was negatively related to teachers' concerns on the use of computers. The result indicates that as teachers gained more teaching experience, they were less concerned about the use of microcomputers. This may be because, as they gained more knowledge on the use of microcomputers, they had many choices about how to use computers in their practice, thus reducing their concerns on the use of computers.

- (b) Teacher's computer knowledge was positively related to the amount of training they had attended. (SUPPORTIVE)

The data collected support the above hypothesis. It is obvious that the more training teachers had, the more computer knowledge they gained.

- (c) Teachers ages were negatively related to their interest in using computers. (OPPOSITE)
- (d) Teachers' teaching experience was negatively related to their interest in using computers. (OPPOSITE)

The data collected were inconsistent with the above hypotheses. From the correlation table, it was found that teachers' ages and teaching experience were positively related to the level of interest in using computers. The results indicate that as teachers' ages and teaching experience increase, their levels of interest in the use of computers also increases.

The tentative hypotheses related to dependent variables are the following.

- (a) Teachers' computer knowledge was positively related to degree of current computer usage. (SUPPORTIVE)
- (b) The amount of training teachers had was positively related to degree of current computer use. (SUPPORTIVE)

The data were consistent with the above hypotheses. It was found that teachers' computer knowledge and the amount of training they had attended were related to the extent of their current use of computers.

Teachers' Attitudes and Concerns

What are teachers' concerns and needs in using computers in their classroom instruction?

What are teachers' attitudes toward the use of microcomputers?

Results from the more intensive analysis, that is, the 3-D plot, and the simple analysis, that is, the drop-line graph and nonparametric analyses, indicate that both groups have several concerns and needs to use computers effectively in their teaching. But these groups expressed their concerns and needs differently.

Data collected through interviews and observations found that group 1 teachers were more concerned about problems caused by the computer, like networking failure or computer breakdown (see Figure 4.9). This group of

teachers was asking for more training at a higher level, like courses on troubleshooting and computer maintenance .

In contrast to group 1, group 2 teachers who lacked knowledge of computers showed a lot of insecurity in using computers in their teaching and were more concerned about their computer knowledge (see Figure 4.10 and Table 4.2). To obtain more knowledge on the use of computers, these teachers were asking for more training at the basic level and later to proceed to a higher level. They also searched for more help from computer experts from the outside (see Figure 4.10).

The analyses of the plot and graph indicate that both groups have similar concerns when using computers in classroom instruction. Both groups were very concerned about classroom management. They felt that it was very difficult to teach a class with 40 students. To help them with this problem, they were asking for computer lab assistants. They felt that with the existence of the lab assistants who could help them to manage their class, they could teach more effectively with computers.

This result is similar to what I had observed in the computer laboratory. Throughout my observation sessions, I found that teachers had difficulties in managing the classroom. These teachers felt that using the computer added to their existing classroom management problems. In general, they had difficulties establishing classroom routines and

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organizational systems and in dealing with the management aspects of teaching.

The tentative hypotheses related to attitudes and concerns are the following.

- (a) Teachers' attitudes towards the use of computers were positively related to the amount of staff development that teachers had. (INCONCLUSIVE)
- (b) The more computer knowledge teachers had the more computer needs to discover. (INCONCLUSIVE)

The correlation table does not show any relationships with the above hypotheses.

The tentative hypotheses related to the dependent variables are the following.

- (a) Teachers' computer needs were positively related to their degrees of current computer usage. (SUPPORTIVE)

The simple analysis showed the data were consistent with the above hypothesis. The results of the analysis indicate that the more teachers used computers in their classroom instruction, the more needs they required to enable them to use the computers at higher level.

- (b) Teachers' attitudes were positively related to level of computer usage. (INCONCLUSIVE)

The correlation result does not show any relationships with the above hypothesis.

Experience Using Microcomputers

How do teachers use computers in the classroom instruction?

Do teachers integrate computers in their teaching ?

From data collected through interviews and classroom observations, group 1 teachers who were more experienced in comparison with group 2 used more softwares. This group of teachers used using software provided to them at higher levels. For example, in word-processing, group 1 teachers taught students how to edit two documents simultaneously and how to import and edit graphics. In BASIC, students were taught not only the basic knowledge, like how to create flow charts, but they were taught to use complicated BASIC command like GOSUB, IF, THEN-ELSE, SOUND, rather than just READ, DATA, END, and PRINT. This group was making quality use of the software. The data also indicate that group 1 teachers used software where students could create more of their own products (see Figure 4.9). For example, students were asked to create their own graphics, like graphs or drawing for graphic presentation. Students were also exposed to software where they could explore on their own and later were required to produce their own products. This shows that teachers who were more experienced were making quality use of the computers. The analyses from the statistics, plot, and graph indicate that group 1 teachers did integrate computers when they were teaching other subject matter (see Figure 4.9 and Table 4.2). But the degree of the integration was very low. They integrated the computer with subjects like language, agriculture science, and mathematics.

Group 1 teachers who were experienced users of computers had shown great desire to make full use of the computers.

The tentative hypotheses related to experience using computers are the following.

- (a) Teachers who use computers at home will integrate the computer more with their subject matter than teachers who do not use computers at home. (SUPPORTIVE)
- (b) Teachers' attitudes toward the use of computers were positively related to the degree of integration of computers in their subject matters. (SUPPORTIVE)

The data collected support the above hypotheses. The correlation data show that teachers who have and use computer at home and teachers' attitudes towards the use of microcomputers were positively related to the degree of integration of computers in their subject matter.

- (c) Teachers' experiences with computers were positively related to the integration of computers in their subject matter. (INCONCLUSIVE)
- (d) Teachers' experience teaching with computers was positively related to the level of use of computers. (INCONCLUSIVE)

The correlation result does not show any relationships with the above hypotheses.

The tentative hypothesis related to the dependent variables is the following.

- (a) Teachers' experiences were positively related to level of computer use. (INCONCLUSIVE)

The simple analysis does not show any relationships with the above hypothesis.

Teachers' Barriers

What are barriers perceived by groups of teachers?

What conditions are perceived by groups of teachers to be most favorable for teachers to effectively use computers in instruction?

Both simple and more intensive analyses of the data show that group 1 teachers felt that the frequent problems caused by the machines was a major barrier standing in their way of a more comprehensive utilization of computers (see Figure 4.9, and Table 4.3). In contrast to group 1, group 2 said the major barriers that stand in their way of a more comprehensive utilization of computers were their lack of computer knowledge and support from higher level people and the organizer (see Figures 4.7, 4.10 and Table 4.2). This group of teachers felt that their concerns and needs have not been fully met. From the data, they expressed very high concerns about computer knowledge and the need for more training and more support. They felt that attending more training would help to increase their knowledge of the use of computers. To help them gain more computer knowledge, they were also seeking for more support from computer experts from outside.

Failure of the keyboard to function, networking problems that caused the computer to "freeze," and the trackballs that failed to work were very common problems faced by these teachers when using computers in

instruction. From my classroom observation sessions, in addition to their frequent computer breakdown, computers that were provided to the schools (in the CIE project) largely represent old technology that lacks power necessary to implement sophisticated instruction as promised by technology visionaries. These less powerful computers have not allowed more sophisticated uses to be implemented. If we are to overcome this barrier, we must break away from putting technology dollars into outdated technology.

Another barrier that was rated considerably high by this group was lack of follow-up in-service training (see Figure 4.12). This group felt that without on-going, follow-up, in-service training, they would be prevented from exploring using computers at more advance levels.

Teachers' great concerns and needs stated above would be the favorable conditions required for these teachers to effectively use computers in instruction. If the organizer could fulfill teachers' concerns and needs, the teachers would be in the conditions which permit them to use computers effectively. The barriers that are perceived by these teachers as a major hindrance can be taken as factors that prevent them to effectively use computers in instruction .

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CHAPTER FIVE

CONCLUSION, IMPLICATION, SUGGESTIONS AND RECOMMENDATIONS

In this study fifteen teachers were interviewed in-depth about their computer usage. Qualitative and quantitative data were collected through questionnaire, interviews, and observation. The questions were based on a conceptual model that focused on five major classes of variables: (1) general context, (2) teachers' backgrounds and characteristics, (3) teachers' attitudes and concerns, and (4) experience using microcomputers by the teachers, and (5) level of classroom use. To gather supportive evidence, classroom and/or laboratory sessions were observed to check for consistency with the evidence gathered from teachers' interviews.

Simple analyses were done to look at the above variables in relation to the dependent variable. In addition all of the perceptual data was also examined to see whether it was possible to differentiate these teachers into two groups. The discussion of the results focuses on many of the details that came from the contrast between the two groups of teachers.

The objective of the study was to find factors that are related to teachers use of computers in their classroom instruction, and the next section of this chapter discusses findings, implications, suggestions and recommendations pertaining to the model.

General Context

Findings on Teachers' Perceptions of Available Support.

Under this heading there are discussions of 3 separate findings (1a through 1c).

Finding 1a:

Teachers in this study perceived that government support is insufficient. (see the heading of Correlations Among Variables).

Relation to the Literature

The study of Plomp and Carleer (1986) concluded that government support of facilities, released time, teaching-learning materials, and financial resources was insufficient. They found out that teachers considered governmental or local school district support crucial for successful implementation.

The finding in this study confirms the findings of Plomp and Carleer (1986) study. Teachers in the current study felt that governmental support is very important because many needed materials and non-material facilities are provided by the government. Some teachers expressed the need of support not only in training but also in terms of money. Teachers studied reported that they do not have enough money, especially to buy educational software to meet students' needs. Teachers who were studied reported that the availability of educational software in schools is very limited.

In the simple analysis it was found that support is negatively related to level of use. This shows that teachers perceived that the support provided by the government decreases with their level of computer usage. The results of more intensive analysis showed that more knowledgeable group of teachers were expressing very strong statements of lack of technical or financial support which is consistent with the statement of the finding.

Conclusion and Implications

Based on the above finding, I can conclude that support from the government is very important and that more experience teachers needed more governmental support. The government must offer opportunities so that individual teachers will have time and real possibilities for getting acquainted with and becoming competent in the use of the new computer technology, as well as have proper materials (hardware and software) at their disposal.

Finding 1b:

The teachers in this study expressed the need of more support materials such as teaching-learning materials and educational software. (see the heading Content Clusters in Teachers' Perceptions)

Relation to the Literature

This finding is consistent with findings of other studies on academic computing. According to Fullen (1985), teaching and learning materials consist not just of written materials, but include educational software and audiovisual resources. He further stated that important aspects of

curricular materials, which are in effect implementation, are quantity, quality, and usefulness of teaching-learning packages as a whole. Good materials provide teachers with a vehicle to understand the innovation and to be able to use it without further instruction. Courseware, intended for teachers' initial use, should contain a large amount of procedural specifications: very accurate how-to-do-it advice focused on essential but apparently vulnerable elements of the curriculum. Support materials should not only contain "technical" information about the use of the computer program, but also detailed advice about the instructional process (Fullen et al., 1987). According to Wilson (1988), the integration of computer use in the instructional practice of teachers, benefits by "infusable" support materials.

Studies by Gary (1988) and Plomp and Carleer (1986) found that schools considered that successful introduction of information and computer literacy courses were highly dependent on material support (e.g., hardware, courseware, and teaching-learning materials). Teachers considered the availability of sufficient teaching-learning materials as one of the most important factors for successful implementation.

Ploom and Pelgrum (1992) found that general purpose software such as word processors, spreadsheets, and database programs were broadly available in the schools they studied. However, educational software was not widely available.

Some of the conclusions made by OTA (1988) on the quality of courseware that were available in schools are the following. much educational software is isolated material, badly attuned to the curriculum (content, materials, strategies) in use (Inspectorate, 1986; Woodhouse &

Jones, 1988) and much software is poorly documented (Jorde, 1985). User guides generally contain "technical" information about operational aspects of the software which is hard to understand. Support materials for the teachers with suggestions on how to integrate the program in the instructional process is frequently lacking (Inspectorate, 1988), and the available educational software covers only parts of the different subject matter domains (Inspectorate, 1988).

These findings were confirmed in the current study.

Teaching-learning materials and educational software are very limited. Even though some schools do have educational software, the teachers studied frequently cited that there was inadequate documentation with some of the software. Teachers reported that the document or material that came along with the software mostly had only technical information. Due to lack of documentation with the software, teachers were uncertain as to its use.

In the simple analysis did not yield much information, but a more intensive analysis showed some substantial differentiation between the two groups in terms of wanting more references and related materials.

Conclusion and Implications

Based on the findings, it is clear that there is a great need, especially for concrete, exemplary, teaching-learning materials for the teachers. The government and the school administration must offer facilities so that individual teachers will have time for getting acquainted and becoming competent with computer innovations.

Proper materials should be available for their disposal. At best, one can conclude that the schools with facilities and software needs to have at their disposal certain teaching-learning materials.

Finding1c:

Teachers in this study perceived that they are not receiving a significant amount of support from the local school district. Teachers who were less knowledgeable were searching for external support such as from colleagues and from computer experts (see the heading of Content Clusters in Teachers' Perceptions).

Relation to the Literature

According to Sheingold (1990), one factor that has contributed to successful technology use is the support and collegiality teachers experience in their schools and districts. A similar result was found by Novak and Knowles (1991) in their study of beginning elementary teachers' use of computers in classroom instruction.

Bell (1981) noted that as teachers engage in the introduction of microcomputers are introduced into teachers' classrooms, they became involved with colleagues facing the same problems and respond in a positive manner to the opportunities afforded to them to share their experiences.

The finding in the current study confirms the above finding. Teachers reported that they had significant support from their colleagues, such as teachers from other schools. They also asked for external support like software and hardware representatives and computer consultants.

A simple analysis did not yield much information. The results from more intensive analysis showed some substantial differentiation between the

two groups in terms of external support. The less knowledgeable group of teachers was asking for more outside support than the more knowledgeable group.

Conclusion and Implications

From this finding it can be concluded that there is lack of expertise on microcomputers in schools. Some of the teachers studied asked for external support either from colleagues or from outside computer experts. This implies that the teachers studied have the opinion that they do not know enough and consider themselves not able to acquire relevant knowledge on their own. If that is the case, teachers need more in-service training that can upgrade their knowledge on the computers.

Findings on Teachers' Perceptions of In-service Training.

In this section there is discussion of separate findings (1d through 1g) related to the above heading.

Finding 1d:

Teachers who were less knowledgeable perceived that the in-service training on computer usage given to them was not relevant, was unsuccessful and not meaningful to teaching (see the heading of Differences Between Groups 1 and 2).

Relation to the Literature

The issue of irrelevance in computer technology training programs for teachers was commonly raised in the review of literature. According to Young (1987), most activities for teachers in seminars and short workshops

on the use of computer that were conducted frequently by the vendors were superficial and dealt on the rudiments of computer literacy, mostly concentrated on menu options. These vendors obviously had increased sales in mind and had no concept of educational or instructional techniques and methodology. Teachers often felt frustrated after the training. Another common source of expertise for training teachers is educational consultants who have already built up experience in computer education; however, the training given by educational consultants also tends to ignore pedagogical issues.

According to Cox (1994), the method of training all teachers in schools had very little success for many reasons and the impact of this training on the regular use of computers in schools was very limited. According Plomp and Carleer (1986), non-material facilities like in-service training that focused on the process of using computer technology to teach and extra time to learn with computers was considered to be one of the factors that contribute to the successful introduction of information and computer literacy courses.

This finding in the study confirms some of the above findings. A simple analysis did not yield much information, but more intensive analysis showed that less knowledgeable teachers perceived that the in-service training they had attended was not focused on teaching using computers in the classroom practice. Instructors did not provide training that directly showed teachers how to apply computers in their classroom teaching. There were no concepts and methodology on how to teach using the computers

involved in the training. These kinds of training programs were perceived to be irrelevant and meaningless to teachers.

Conclusion and Implications

Based on the findings, it can be concluded that computer training programs that do not deal with the use of computers in classroom instruction that are closely related to teachers' own practice will not generate a successful end result for the teachers. The findings imply that it is important to choose the instructors and on what they will be focusing in the training carefully. Choosing an educational consultant or trainer can have a major impact on teachers' use of microcomputers in classroom instruction.

Finding 1c:

Teachers perceived that the training provided did not meet their concerns and needs (see the heading of Differences Between Groups 1 and 2).

Relation to the Literature

The issues on computer training that did not meet teachers' needs and concerns are common in the review of literature on computer usage training. According to Woodhouse and Jones (1988), the instructors, usually experienced users of the software, design and organize the course in accordance with their own beliefs and experience. Instructors usually have little specific knowledge of the level of ability, attitude, concerns, and needs of the participants before the course. Consequently, they plan for what they, the instructors, think is an appropriate level for the participants.

Kinnaman (1990) and Rossett, Garbosky, & Browning (in press) state that most in-services focus solely on the wonders of the technology and ignore the needs and concerns of individuals involved in the change. Without identifying teachers' needs and concerns and implementing strategies that ensure transfer of the technology, in-services will continually fail.

The findings in the current study are consistent with the above findings. Simple analysis did not yield much information, but more intensive analysis showed that teachers studied perceived that the in-service training did not mesh with their level of concerns and needs related to the use of microcomputers in the classroom practice. The less knowledgeable group of teachers perceived that the training were not appropriate for their level. It was either too advanced or too basic.

Conclusion and Implications

It is important that those who are given the responsibility for teacher training understand the personal aspects of computing in planning and implementing training programs for in-service teachers. Not all teachers who attended the training are at the same knowledge level. Teacher pass through different stages of concern and needs, and this should be taken into consideration in the planning of the in-service courses.

Finding 1f:

Teachers perceived that in-service courses were not effective in training them to use computers in education (see the heading of Difference Between Groups 1 and 2)

Relation to the Literature

According to Young (1987), much of the training focuses on the computer itself and how it works. Some courses train teachers only to use the computer as a teaching aid. This is a limited use of computers. Teachers are not trained on how to teach using a computer. Computer training, as stated by James Dunne of Teachers College in New York, tends to deal with getting people acquainted with low-level computer literacy activities. Just getting acquainted with a microcomputer is not enough. It will not educate the learner on how to teach students to use computers and computing.

The results of the current study agree with the above findings. Teachers in the current study felt the present training was not well structured enough to help them to use computers in their classroom setting. They perceived that the training was ineffective because there was no transfer of skills from the training to classroom practice. Knowledge obtained in the training was not linked or related to the use of computers in teaching, thus it could not be applied to the classroom environment.

Conclusion and Implications

Teachers in the study perceived the training as ineffective because the training programs did not teach them how to teach using computers and how to integrate computers into teaching. Teachers perceived that the present training did not help them use the computers in more productive ways. These teachers probably will continue to have the same negative attitude for every computer training course. Unless the present training of teachers in the use of computers is refocused and redefined, the highly desired and

expected increase in educational quality and productivity which computers are predicted to facilitate will not occur. This means that teachers need more training relating to the use of computers as part of the total teaching process.

Finding 1g:

Teachers in the current study perceived that there is lack of on-going follow-up training and staff development on the use of computers in teaching (see the heading of Similarities of Groups 1 and 2)

Relation to the Literature

Fullen (1985) mentioned that ongoing in-service and staff development are important factors affecting the implementation of change. The study of Plomp and Carleer (1986) showed that teachers considered an in-service course as an important factor. Teachers considered it is important to have continuous in-service training. Training should occur as frequently as possible, and it should be narrowly linked with the daily problems they encounter in their teaching practice. They have a real desire for concrete materials and ideas for the lessons and for training on a concrete level.

This finding in the study confirms some of the above findings. Teachers would like to have ongoing in-service training and staff development on a concrete and specific level, close to their daily classroom practice.

Simple analysis did not give much information, but more intensive analysis showed that both groups of teachers perceived a lack of ongoing in-service training and staff development.

Conclusion and Implications

Teachers in this study need more training that focuess on teaching them on how to use computers that is closely related to their classroom practice.

Findings on Hardware and Software

Finding 1h:

Teachers who were more knowledgeable perceived that the computers provided for them to teach with are old and obsolete (see the heading of Differences Between Groups 1 and 2).

Relation to the Literature

According to Hasselbring (1991), the computers that are installed in many schools are low quality machines which largely represent old technology that lacks the power necessary to implement sophisticated instruction. Hannafin, Dalton, and Hooper (1987) said that users believe that these is still not enough hardware and software in schools to encourage large usage.

This finding in the current study confirms the above findings. Teachers studied expressed that they were not satisfied with the hardware and software provided by the educational ministry. Teachers frequently reported that the machines provided were too slow, lacked power and capacity, and were not suitable for more complicated usage. The hardware provided also had caused many problems to teachers. In terms of software, teachers felt that they did not have enough appropriate educational software to match students' ability level.

Simple analysis did not give much information, but more intensive analysis showed some substantial differentiation between these two groups in terms of hardware provided to them. The more knowledgeable group of teachers perceived that the machines provided caused a lot of problems.

Conclusion and Implications

It is clear that schools are provided with new, but low-cost, obsolete microcomputers. Teachers will not be able to implement sophisticated instruction as promised by technology visionaries. If the schools want to teach computer awareness, a rather low cost or less powerful computer could do the job. However, if the schools want to teach computer literacy, possibly as an examination subject near the end of the secondary schooling, better computers are needed, and teachers need much better, well-structured training to meet the stated objectives.

Teachers Background Characteristics

Findings on Teachers Background, Prior Knowledge, Feeling and Preparation in the Use of Computers.

In this section there is several discussion of separate findings (2a through 2c) related to the above heading.

Finding 2a:

Teachers who were less knowledgeable perceived that they needed more skills and adequate knowledge to implement computer technology in the classroom. Teachers felt that having basic knowledge of computers is insufficient to teach with computers in the

classroom. They felt uncomfortable and under prepared to teach with computers (see the heading of Difference Between Groups 1 and 2).

Relation to the Literature

This finding confirms the findings of a number of studies that addressed teachers' computer knowledge in the use of computers in teaching. Summers (1988) found that teachers rated very highly in using computers effectively in the classroom. She also found that teachers who do have computer knowledge often have a very limited and vague knowledge about computer usage.

Studies by Bychowski, Deborah, Van and Ralp (1984), Gary (1988), and Wilson (1990) showed that most teachers surveyed did not feel that they possessed adequate knowledge of the aspects of computer technology necessary to effectively use a computer in the classroom.

In the current study, some of the teachers felt the same way with respect to computer knowledge. Teachers who were studied had great concern about their lack of knowledge in the use of computers. They felt that they possessed inadequate knowledge and skills and were ill-prepared in the use of computers in their classrooms.

The results of the simple analysis did not yield much information, with respect to computer knowledge, but more intensive analysis showed some substantial differentiation between these two groups. The less knowledgeable group of teachers was very concerned about lack of computer knowledge.

Conclusion and Implications

I can conclude that some of teachers in the current study perceived that they did not possess enough knowledge on the use of computers. Lack of computer knowledge and feeling of inadequacy, insecurity, and lack of preparation in the use of computers in their teaching by these teachers needs to be corrected by computer classes. Local school districts need to take seriously teachers' concerns about their lack of computer knowledge and provide more in-service training and staff development. The future holds great promise for the use of the microcomputer in the classroom. However, to achieve this potential, it is vital that educators become knowledgeable in the use of computers.

Finding 2b:

Teachers who were knowledgeable in the use of computers used computers at a technical level and integrated computers in their teaching of other subjects (see the heading of Differences Between Groups 1 and 2).

Relation to the Literature

According to Sheingold (1990), as teachers gained more experience over the years and became more knowledgeable about the use of computers, they tend to experiment more with word processing and databases and used less drill-and-practice with students.

The finding in this study is consistent with Sheingold (1990). Knowledgeable and experienced teachers who had used computers for more than three years tend to use more application programs and less instructional or content specific programs.

Results of the simple analysis showed some substantial difference between these two groups of teachers in terms of knowledge of computers and their level of use of the computers. More knowledgeable teachers used computers more and at a higher level than the less knowledgeable group.

Conclusion and Implications

Based on the findings, it can be concluded that teacher background characteristics are very important, and strongly associated with the way teachers' use computers in their classroom instruction. As teachers gained experience in the use of computers and developed more practice, they tended to use less software that is related to specific content. Teachers feel more comfortable in making other choices of practice and use different approaches to the use of computers in their teaching.

Finding 2c:

Personal factors such as teachers' knowledge of the computer and external factors such as students grade levels and their ability levels influenced teachers' computing choices (see the heading of Background Characteristics).

Relation to the literature

These findings confirmed the findings of studies about computer use in schools. According to Doyle (1979), Haller (1967), Hoy (1967-69), Pollard (1982), and Plomp et al. (1990), the type of students differ in their ability levels which has been found to greatly influence teachers' types of methods and teaching materials which are selected and used. Novak and Knowles (1991) in their review of studies of teachers' computing influences, found that

there were external and internal factors influencing teachers' use of computers. External factors included students' characteristics such as grade levels and ability levels. For example, where there are students with low ability levels, teachers may choose to use drill-and-practice computer programs to reinforce basic academic skills. Internal factors include teachers' knowledge and understanding of computer software. For example, teachers who are familiar with the instructional software are more likely to include it in their instruction.

Sheingold and Hardley (1990) found that teachers' own motivation and commitment, administrative support and support from colleagues, and access to sufficient technology were some of the factors that contributed to teachers' achievement with computer use.

The findings in the current study confirm some of the findings in these studies. The teachers were highly motivated in the use of computers in their teaching, and their personal and external factors seemed to influence their use of computers.

In the current study it seems that age and experience in teaching did not seem to influence teachers in the use of computers. However, experience in teaching with computers seemed to determine teachers' effectiveness at integrating computers into the classroom. Teachers with computer experience seemed to use variety software programs. Teachers who were teaching low ability classes tended to use more drill-and-practice computer programs to reinforce students' basic academic skills.

The results of the simple analysis showed that background characteristics such as age and experience in teaching did not have any

relationships with the level of use. More intensive analysis showed substantial differences between groups of teachers with level of use. Teachers who were more experienced in teaching with computers used computers more at a higher level than the less knowledgeable group of teachers.

Conclusion and Implications

Having experience teaching with computers seems to be an important factor for effective use of computers. This implies that it takes time for teachers to be effective users of computers in their classroom instruction.

Teachers' Attitudes and Concerns

Finding on Teachers' Attitudes toward Computers

Finding 3a:

The more knowledgeable group of teachers showed a more positive attitude toward the use of microcomputers in classroom instruction despite the problems faced by teachers when using the computers (see the heading of Teachers' Attitude).

Relation to the Literature

The finding in the current study is consistent with findings in most of other studies on teachers' attitudes on the use of computers. Much research finds that in general teachers have been found to have positive attitudes toward computers. According to Woodrow (1991), the success of any new educational program on computer technology depends largely upon the support and attitudes of teachers involved. Randhawa and Hunt (1984)

found that teachers are likely to resist not only attempts but also suggestions for computer introduction if they perceived computer technology negatively.

Becker (1985) reported that attitudes towards computers were not related to sex, age, or job level relationships among cooperative extension workers. The current study confirms some of these findings. Attitudes of teachers studied seemed not to be related to their sex, age, and teaching experience. The more knowledgeable group of teachers showed generally high motivation in the use of computers and positive attitudes toward computer technology.

The results of a simple analysis did not give much information in terms of teachers' attitude with level of use, but the more intensive analysis showed differences between these two groups. Teachers who were more knowledgeable showed more positive attitudes toward the use of computers than the group of teachers who were less knowledgeable.

Conclusion and Implications

It is clear that teachers in this study expressed positive feeling in the use of computer technology. Despite the fact that these teachers were facing problems with computers, they want generally to give them a try. Positive teacher attitudes towards computing are critical for computers to be effectively used and integrated into a school's curriculum.

Findings on Concerns Related to the Use of Computers

Finding 3b:

Teachers expressed many concerns related to the use of computers. Some of the concerns were related to time, software, and classroom management (see the heading of Content Clusters in Teachers' Perceptions).

Relation to the Literature

This finding is consistent with the findings in the reviewed literature. According to Sheingold (1990) and Plomp and Carleer (1987), teachers are the primary users of computers with children, and these teachers expressed many concerns about the use of computers that can enhance their teaching and students' learning. Among the concerns reported were lack of software, lack of time, and lack of training on the use of computers.

In this study concerns expressed by teachers are related to time, software, classroom management, and student computer knowledge. Other concerns such as lack of training and lack of computer knowledge have been discussed in detail in previous sections.

For time-related concerns, the teachers studied expressed many different concerns. Some reported that they had to teach other subjects and to carry out other responsibilities, so they did not have enough time to prepare lessons and handouts for computer usage. They needed more time, especially when preparing lessons that were related to the use of computers, because teaching with computers was a new field to them.

Some teachers reported that there was insufficient time for each child to have a turn at using the computer due to the machine's frequent breakdown. Teachers said that even though they were given two periods to

teach, they found that it was difficult to complete the required material in the computer literacy unit within the specified amount of time. They also complained that there is insufficient time to complete required objectives and to use the computer.

The most popular time-related concern that was frequently cited by the teachers was insufficient time for them to learn and master the computer, either by themselves or as a group.

For software -related concerns, some teachers reported that the level of software provided for them to teach was too sophisticated for their students. They would prefer to use less complicated software with their students at the introductory stage. Especially at the basic level, it is sufficient to expose the students with simple, easy-to-follow software. For instance, the teachers would prefer to use a simpler word-processor than the one provided (WordPerfect).

Some teachers felt that they did not have appropriate software to match the needs of students. Some teachers reported that some of their students were good with computers, and the teachers would like the students to explore other software on their own and later demonstrate it to the class. But, due to limited software available, this kind of activity was not possible.

For classroom-management concerns, the teachers studied repeatedly said that it was quite difficult to maintain discipline while in the computer laboratory. The level of noise made by the students in the computer laboratory increased. Most of the teachers complained that there in no lab assistance to help them to control the classroom computer usage. When

more than one group of students made mistakes and faced difficulty in following the lesson, this would slow down the lesson. Most teachers reported that it was very difficult to organize such a large number of students.

The results of the simple analysis did not give much information, but more intensive analysis showed substantial differentiation between these two groups in terms of concerns related to the use of microcomputers.

Conclusion and Implications

Based on the findings, it is very obvious that the teachers studied have many concerns related to the use of computers in teaching. The administrator should look more in depth about these concerns and take serious actions in order for teachers to be able to do their jobs effectively.

Experience Using the Microcomputers

Findings on Teaching Activities for which Teachers Use Computers.

In this section there is discussions of separate findings (4a through 4c) related to the above heading.

Finding 4a:

Teachers used many different modes of computers in their teaching activities. The mode of computer use for teaching activities ranged from games to language programming (see the heading of Summary of the Analyses).

Relation to the Literature

This finding is consistent with the findings in the literature reviewed. Computer use in Plomp and Pelgrum's (1992) study ranged from playing games to computer-assisted instruction. Plomp and Pelgrum also found computer use for demonstration in front of class, introductory courses about the computers, and remedial and enrichment CAI. Dalton (1987) confirmed the findings of Plomp and Pelgrum's study.

In the current study, the mode of computer usage for teaching activities varied among the teachers. Most of the teachers used computers to teach computers and software application, not to integrate the computers into the teaching of regular subject matter. Teachers used a wide variety of applications ranging from basic productivity tools such as word-processors, spreadsheets, and databases to more advanced application such as language programming.

The results of the score of the dependent variables that were formed from various variables related to the level use showed that teachers used computers in many different ways. The results of the simple analysis did not give much information, but the data from the dependent variables showed substantial differentiation between these two groups in terms of the degree of using different software.

Conclusion and Implications

It is clear that the teachers studied used a variety of modes in their teaching activities. To motivate teachers to continue using various modes in their teaching activities, administrators should provide more facilities which

are flexible enough to accommodate a range of possible uses. Teachers should also be taught not only to teach the use of computers and software application, but also how to integrate the computers into other subject matter, otherwise the issues of integrating computers into subject matter will remain as a problem. Teachers need different kinds of experiences. They need some experience that relates how they can integrate computers into the curriculum.

Finding 4b:

Teachers in this study used word-processors and other text-processing tools more than other software programs(see the heading of Summary of the Analyses).

Relation to the Literature

Sheingold (1990) found that most of the teachers used word-processing and other text-processing tools in their teaching in comparison to other software programs. These tools are playing a central role in the classroom and appear to have the broadest current use across the curriculum. The most obvious is the use of word-processing in language arts. Not-so-obvious is the use of word-processing in subjects like social studies and science. A similar finding was reported by Erion and Moeller (1991). They found that about 85% of the teachers used computers primarily for word-processing.

This finding confirms the finding in the current study.

Word-processing was used very frequently and widely by the teachers studied. Some teachers used this program in teaching other subject matter, most commonly in language.

The results of the simple analysis did not yield much information, but data from the dependent variables showed wide range of score indicating substantial differentiation between these two groups in terms of the degree of using word-processing in their teaching.

Conclusion and Implications

It is obvious that word-processing is among the most popular software programs used by teachers. Most teachers used this program as a tool to enhance student performance. The findings reinforce the notion the word-processing is simple and eas-to-use software, and it can be used broadly across the curriculum. This is certainly one area where it should be a lot easier to integrate into the subject matter instruction.

Finding 4c:

Teachers who were experienced users of computer technology used fewer content-specific programs over the years (see the heading of Summary of the Analyses).

Relation to the Literature

According to Sheingold (1990), the percentage of teachers who frequently use computers for enrichment, remediation, and drill declines slowly with years of experience.

This finding in the current study confirms the above finding. Data from the dependent variables showed teachers who were experienced users of the computers in teaching used fewer content-specific programs.

Conclusion and Implications

What teachers do with computers in their classroom reflect how much experience they have had. As teachers become more expert and comfortable with the use of computers, these practices play a lesser role over time.

Teachers gradually mastered many other practices over the years. As they developed a more well-organized, workable set of practices, they could flexibly make choices about using new applications and about using familiar applications differently.

Barriers in the Use of Computers

In this section there is discussion of findings (4d through 4f) related to the above heading.

Finding 4d:

Some barriers that teachers perceived in their computer use for teaching included lack of computer knowledge, lack of follow-up training, lack of funding, and lack of software that could be integrated into other subject matters (see the heading of Perceived Barriers).

Relation to the Literature

Teachers most frequently mention as their problems a lack of software, curricular materials, hardware, availability of time, and organizational constraints. It is interesting that all these problems are related to factors conditional for the implementation of computers in education. Plomp and Carleer (1987) found similar results in a study of problems in the

implementation of information literacy, the Dutch variant of computer literacy.

The findings in this study are consistent with the above statements. These factors are found to be the common barriers faced by teachers in using computers in education.

The results of the simple analysis did not give much information, but more intensive analysis showed substantial differentiation between these two groups in terms of these barriers.

Conclusion and Implications

It is clear that most of the problems related to use of computers in education are closely related to conditions that the technologies do not complicate the problem of getting teachers and students to integrate the technology into the classroom instruction.

Finding 4e:

Lack of time for learning, practicing, and planning were perceived to be major factors that prevent teachers from using computers effectively in their practice (see the heading of Perceived Barriers).

Relation to the Literature

According to Carmicheal et al., (1985); Elder et al., (1987); Inspectorate (1986), and van der Akker, et al. (1992), teachers experience many practical problems when they start to use computers. They concluded that the computer usage demanded much time-consuming management and organizational activity from teachers. Time to plan for computing was

reported to be a major barrier for teachers in Sheingold and Hardley's study (1990). Teachers devote much time and effort to using computers in the classroom, as well as spending their own time to learn about technology.

Extensive support was crucial in the teachers' use of computers, and time to master computer-based teaching strategies was also an issue. According to Sheingold (1990), it takes five or six years of teaching with computers before teachers can achieve a current comfort level with computers. McMeen (1986) and Plomp and Pelgrum (1992) supported these findings.

Lack of time was also mentioned by teachers in the current study. Some of teachers studied directly related lack of time to the complexity involved in mastering the technical operations of the computer. Some teachers reported there was a lack of time to plan for the lessons.

The results of the simple analysis did not give much information, but more intensive analysis showed substantial differentiation between these two groups in terms of barrier related to lack of time.

Conclusion and Implications

Based on the findings it can be concluded that lack of time is one of the factors perceived by teachers as a barrier in implementing computer technology. For teachers to be able to learn to use software, it should be simplified, that is, provide more simple software that does not take too much time for teachers to deal with the material provided. There should be appropriate technology, that is, appropriate hardware with appropriate

software programs. Teachers should be given more time if computer technology is to be effectively use in their classroom practice.

Finding 4f:

The more experienced and knowledgeable group of teachers perceived that hardware problems such as frequent computer breakdowns to be one of the barriers that prevent them for using the computers more effectively in their classroom instruction (see the heading of Difference Between Groups 1 and 2).

Relation to the Literature

According to Hebenstreit (1984), some of hardware problems are common to developed and developing countries because they are purely technical problems. One of the common problems is when the computer breaks down and needs some parts, and it is found that no maintenance or spare parts are available. This is because each year some companies disappear while others are created; so that after some time, the spare parts for the types of machines the schools are using are no longer available. Hebenstreit also stated that maintenance can be a very critical problem outside of big cities and even in big cities when manufacturers not have a permanent local representative.

Plomp (1987) found that outside big cites in rural areas good local agents or distributors are lacking. One of the reasons for weak dealer networks is that local agents show little interest in after-sales service because the machines provided to schools were bought at discounted or low prices and are obsolete, or become obsolete within a year or two. Local

agents normally have low response or do not respond at all to older machines that have technical problems.

This finding in the current study is consistent with the above findings. Teachers studied frequently reported that computer technical problems were perceived to be one of the major barrier. Teachers had to wait several months for local agents to pick up the machines and it took couple more months for repairs. The long wait for repairing computers was perceived to be very problematic to teachers who need to make use of the machines.

The results of the simple analysis did not give much information, but more intensive analysis showed some substantial differentiation between these two groups in terms of problems caused by the hardware.

Conclusion and Implications

Based on the finding, it can be concluded that there is very poor technical support provided to teachers either from local agents or from the organizer. Teachers seem to be fully dependent on outside agents for repair of hardware problems. This implies that most teachers studied have no knowledge at all about computer maintenance. Teachers perceived that they should have some knowledge on the maintenance and troubleshooting of the computers.

Summary Of Major Implications

In summary, computer use by the teachers in this study was influenced by variety of factors. The findings of this study reinforced the notion that there are many factors that support the implementation of new

technology such as computers in schools. According to Fullen (1982 & 1985), effective use of computer technology occurs if certain elements occur in combination: active administrative support and leadership especially at the school level; focused, ongoing in-service or staff development activities; the development of collegiality and other interaction-based conditions especially at the school level; attention to teachers' concerns and needs; and the selective use of external resources (both people and materials) [Fullen, 1985].

In the CIE program, hardware and software were provided by the government. But teachers were not satisfied with the hardware and software. The machines were found to be running very slowly, and the software provided was too complicated. If we want speed with modern software technology, we cannot do it with ancient hardware technology. This implies that there is incompatibility between the hardware and software. If one of the objectives of the project is to integrate technology into subject matter, a simpler faster software should be used.

In this study teachers were highly motivated and expressed positive attitudes towards the use of computers in their teaching, but they were constrained in their use by lack of knowledge on the use of computers. Even though computers were provided for the teachers, they needed more instruction and support, especially from the administrator, for the use of these machines in their classroom instruction. Teachers need more training and field experience with the use of computers such as actively using them for instructional purposes which were practical and realistic, as well as opportunities for substantially enhancing practice.

Local school districts must go beyond simply providing hardware and software to teachers; they must also provide extensive support for using these materials in classroom contexts. This is particularly important for teachers who are new to this technology and need support and assistance with materials with which they may not be familiar, such as computers. Teachers also need time to learn and become comfortable with their new surroundings related to computer use. These teachers need practical hints and guidance related to integrating computer technology into classroom instruction. They also need help in the classroom management aspects of the computer, especially techniques for teaching computers to a large number of students.

Rarely is the situation such that teachers can be deemed to have acquired these necessary skills through their initial training. Teachers need additional courses beyond the first course. They need specific, ongoing training and staff development to acquire necessary skills on the use of computers. Specifically, in-service training not only provide knowledge to teachers on computer use, but also helps to transfer that knowledge and these skills to actual classroom implementation.

The government should make changes in the training given to teachers. They should be more sensitive to selection of instructor and resource persons with strong background characteristics in relation to use of computers. The government should listen to teachers and focus on their needs and concerns in planning for future in-service training.

The current structure on the in-service training as indicated by Sheila (1991) puts roadblocks in the paths of teachers who want to implement the most exciting and educationally valid uses of technology.

Providing obsolete or low range computers to schools deters teachers who want their students to use technology as a production tool for interdisciplinary project. Giving teachers limited time to learn and think in order to use technology well is also detrimental. Organizing schools so teachers don't have sufficient periods of time away from instructional and routine duties puts a roadblock in the path of teachers who wish to coach and help their colleagues in the use of technology. Structuring schools so that a teacher teaches 41 periods a week deters that person from spending adequate time to develop effective lessons plan to teach students with computers.

The findings in this study are not different from those found in studies from United States and other countries. There is a lot of common ground between the kinds of things that I found in Malaysia and those of other studies despite the fact that there is a somewhat different context here. There is nothing especially new about these findings and nothing uniquely Malaysian in a lot of what I found. In general, I can say that the Malaysian government is not implementing computer technology according to what is desired by teachers. They are following a strategy that keeps technology to a minimum. The government has to change a number of things, such as training strategies, the kinds of software that are appropriate to the machine provided. They have to simplify a lot of things because it is too hard for teachers who do not get enough exposure, training , appropriate machines, and experience to do things that are do-able. The ministry has to trust where the society is, from an educational point of view. It would be a major problem to use old, obsolete hardware with modern software. It would not be an appropriate technology. The Education Ministry in Malaysian in

relation to the use of computers should modify the setting for technology so that things can run more smoothly with the kinds of hardware and software being provided that runs along with the objectives of the ministry.

After discussing the results in the preceding section, I must conclude that the use of computers by teachers is highly influenced by a combination of factors under study. The model proposed earlier can be considered to consist of important factors associated with teachers' effective use of computers. These factors present only in a limited fashion in these schools in Malaysia.

Computer technology will indeed be limited in its effective classroom practice unless the contexts which hinder the use of it are modified.

Suggestions And Recommendations

This section describes suggestions and recommendations for administrators, and teachers. These suggestions and recommendation are based on the findings in the current study.

1) Learning in private

To increase teachers' computer knowledge and familiarity with hardware and software, teachers should have access to computers during their free time and be allowed to learn them privately. Many studies of computer education as an innovation have shown that level of teacher familiarity with the hardware and software is a major factor in the success or failure of the innovation (Cox, Rhodes and Hall, 1987; DES, 1987; Heywood and Norman, 1988; Hall and Rhodes, 1986).

Teachers who have the opportunity to learn in private, by working in a quiet corner in the staff-room or by taking a microcomputer home on weekends and during vacations, become effective users in the classroom. When teachers have the chance to consolidate work undertaken in short in-service courses, their confidence in their capacity to handle innovation in the classroom increases rapidly (Bleach, 1986).

2) Training teachers as technicians

It was found that technical support for the schools is extremely difficult to find. One possible solution is to train someone in-house to be responsible for the maintenance of the hardware and software. Involving staff whose responsibility is to make sure that hardware and software perform reliably in schools is vital to the success of computer education initiatives (Heywood and Norman, 1988). The MOE should invest in the necessary training within the development program, so that during the early years a central pool of technical as well as educational expertise is firmly established under the control of the MOE or one of its departments.

3) Computer studies as one of living skill subjects

Currently computer subjects are only taught to grade one and two students. Once these students are in grade three, they are no longer exposed to computers. The basic knowledge of computers that students had in the first two years will slowly diminish. This would be a great loss to students, and the effort to give students an interest in and use of computers will not be achieved. Computer subjects should be taught continuously from

grade one to grade five. CIE or computer studies' courses should be taught as one of living skill subjects. There should be examination of students' achievement. The courses should aim at preparing secondary school students for an examination. Such courses should include substantial knowledge of how computers are used, plus hands-on experience of applications that help students prepare for jobs in the market place.

4) Future In-service training

Administrators may need to match teachers' preferences when planning future computing training. Teachers' preferences may be an indicator of the satisfaction they derive from their use of computers. Future training should be focused on the use of microcomputers that are linked to teachers' daily classroom practice. Some of the computer training perceived by teacher in this study included maintenance of computers and integration of computers with other subject matters.

5) Collaborative learning through "coaching" technique

One of the findings in the current study is teachers felt that provided in-service training was not effective, was unsuccessful and not meaningful to some of them. Some teachers do not employ the concepts and procedures suggested by the expert in the training program. Often, this is because the support structure collapses as soon as the expert walks out the door (Browne, 1991). One suggestion to help teachers employ what they had learned into their classroom practice is a technique called "coaching." Joyce and Showers defined coaching as "an observation and feedback cycle in an ongoing

instructional or clinical situation" (1981, p. 170). This is a critical component in transferring workshop information to classroom application.

Coaching is usually established in a one-to-one tutoring situation with a novice and an experienced mentor teacher or in a cooperative group of grade-level or domain-specific teachers. Regardless of the method used, a salient feature of coaching is a collegial, nonthreatening environment which is sensitive to the teachers' level of expertise.

One of the greatest benefits of coaching, according to Browne (1991), is that it helps develop fluency in the learner's knowledge acquisition, retention, and usage. The guidance, help, and support provided with coaching tends to reduce the cognitive processing bottlenecks of learners, thereby leading to quicker development of automatic usage and expertise.

According to Browne (1991), to facilitate optimal performance, support coaching teams should be formed at each school site. These teams should meet twice a month during regularly scheduled staff meeting times in order to (a) provide teachers with the opportunity to share effective teaching strategies; (b) collaborate to solve system-use difficulties; (c) provide time to explore courseware; and (d) provide support, encouragement, and guidance for group and individual goal setting.

This technique, willingness to learn from each other, is very similar to Palincsar and Brown's reciprocal teaching model (1984).

6) Involve in Professional Computer Organization

Surprisingly, all teachers in the current study reported that they were not members of any professional computer organization. Teachers should

be involved in organizations that are related to computer technology.

Becoming an active member in a professional computer organization would help teachers gain computer knowledge through workshops, seminars, and conferences.

School administrators should give teachers' incentives such as time outs or replacement teachers so that they can be actively involved in the computer organizations. As motivation, full-time classroom teachers who are given technology leadership responsibilities should have the opportunity to attend technology-related workshops and state and national conferences. This way they may to explore beyond their own classrooms, then bring back the knowledge they have gained.

6) Teaching computer literacy with freeware and shareware

Lack of funding or financial support to buy software was one of the findings in this study. Teachers should be exposed to several software packages productively. But cost can be a major hurdle for schools to buy well-known programs as educational tools. It cannot be denied that there are major advantages in using propriety software in an educational setting. An alternative to high-cost propriety software is to use freeware/shareware programs, at least for introductory purposes. Even though the freeware/shareware programs lack of full range of features found in the higher-priced retail versions, they can be used to teach the fundamental concepts of the applications. If teachers need to know the concepts of how to use the software, these restricted-capability programs may be adequate.

According to Hobart et al. (1988), there are benefits to shareware

- (a) unlike proprietary software, a shareware program may be shared with others as long as it is distributed with all portions of the programs intact;
- (b) the user of the program is obliged to pay only a small fee (usually between \$10 to \$90) to become a registered user;
- (c) Freeware/shareware provides a toolkit that is low in cost and has full-featured programs;
- (d) piracy in open labs using freeware/shareware is not a concern; and
- (e) not only are initial registration fees less in the cost of a propriety package, but program updates often are provided at no cost.

APPENDICES

APPENDIX A

APPENDIX A**Research Instruments**

This appendix contains the research instruments for this study. The instruments are presented in three categories.

Category One: Questionnaire administered to teachers.

Category Two: Interview Guide for teachers.

Category Three: Observation Guide

TEACHER INTERVIEW

TO: Teacher

I am doing a doctoral dissertation about variations in the ways teachers use computers in their teaching in the state of Selangor.

I would like to interview you on general context, your background, attitudes and intentions toward the use of computers, and the ways you use computers in your teaching. There are no “right” or “wrong” answers to the questions in the interview. You are simply asked to give your own ideas or feelings. After the interview, I want to include observation of some of the ways you use computers in your class or laboratory.

The interview will take about 1-1/2 hours or less, two observation sessions will take about 40 minutes each, and follow-up interview will take about 1 hour if necessary.

I would like to audio-tape and take notes in sessions. The interview will involve asking you to describe in detail your teaching practices, your background, attitudes and intentions, your computer use, subject matter, and classroom events. During the observation sessions, I would like to observe and take some notes about the events in the classroom. I may follow this up with a few questions after class or during the follow-up interviews.

All information collected will be kept confidential. All code names, and transcripts of interview will be stored in a secure location. The audio-tapes in this study is used as backup to the interview forms. This is to ensure that no information will be left out. The audio-tapes will be erased once the data collected from interview is verified to be similar to the recorded tape. Your responses to the questions will be combined with others who are cooperating in this study.

I would also like to include excerpts from the interview transcripts in presenting the report of this study. I will disguise any personal identifiers when writing the report and in any presentations or publications.

Kindly complete and sign the consent form below.

CONSENT FORM

I have read the above statements and I consent to participate in this study. I understand that I can refuse to answer any specific questions, and I am free to withdraw my participation in this study at any time.

_____ (Signature)

If you have any questions related to this study please contact Norhayati, phone no: (517) 355-0907

TEACHER INTERVIEW GUIDE

Part 1

School ID.Code_____ District_____

Teacher ID. Code_____ Grade _____

Section 1: Demographics teachers and their school.

(A)

1. School Grade Level 1-[] A-level 2-[] B-level

2. Total number of teachers in your school .

1-[] 0-20 2[] 21-40 3[] 41-60 4[] 61-80 5[] 81-100

3. Total number of students in your school .

1-[] 100-500 2-[] 501-1000 3-[] 1001-1500 4-[] 1501-2000 5-[] >2000

4. Gender 1-[] Male 2-[] Female

5. Age 1-[] < 20 2-[] 20-25 3-[] 26-30 4-[] 31-35 5-[] > 35

6. What is your highest educational level?

1-[] College certificate 2-[] Diploma 3-[] Bachelor 4-[] Master

7. What is your area of specialization?

Major : 1-[] Math

Minor :

1-[] Math

2-[] Science

2-[] Science

3-[] Language

3-[] Language

4-[] History

4-[] History

5-[] Geography

5-[] Geography

Other _____

Other _____

8. How many years of full-time teaching experience have you completed including the current year?

1-[] 1-5 yr. 2-[] 6-10 yr. 3-[] 11-15 yr. 4-[] 16-20 yr. 5-[] 21-35yr.

9. Elementary school teaching experience?

1-[] 1-3 yr. 2-[] 4-6 yr. 3-[] 7-10 yr. 4-[] 11-20 yr. 5-[] 21-35yr.

10. Middle/Junior High school teaching experience?

1-[] 1-3 yr. 2-[] 4-6 yr. 3-[] 7-10 yr. 4-[] 11-20 yr. 5-[] 21-35 yr.

11. High school teaching experience?

1-[] 1-3 yr. 2-[] 4-6 yr. 3-[] 7-10 yr. 4-[] 11-20 yr. 5-[] 21-35 yr.

12. College/University teaching experience?

1-[] 1-3 yr. 2-[] 4-6 yr. 3-[] 7-10 yr. 4-[] 11-20yr. 5-[] 21-35 yr.

Courses taught ? _____

Instructions:

In this section you will be asked questions that require you to rate the response on the scale from 0 or 1 through 5, where:

- 0 = NONE
- 1 = VERY LOW (VL)
- 2 = LOW (L)
- 3 = MODERATE (M)
- 4 = HIGH (H)
- 5 = VERY HIGH (VH)

For some other questions you are required to use the following scales:

- 0 = NOT AT ALL
- 1 = SLIGHTLY
- 2 = SLIGHTLY TO MODERATELY (SL-MOD)
- 3 = MODERATELY
- 4 = MODERATELY TO HIGHLY (MOD- H)
- 5 = HIGHLY

Section 2: Teacher Experience, Support, and Training

First, I would like to ask you about when and how you came to use microcomputers for instruction in your school.

1. How many years have you been teaching with computers?

1-[] 1 yr. 2-[] 2 yr. 3-[] 3 yr. 4-[] 4 yr. 5-[] 5 yr.

(a) How many years ago did you first get interested in computers?

(b) Tell me about what first got you interested?

2. What year did you first use computers?

3. How did you become a CIE teacher?
 1-[] volunteered 2-[] selected by the school

On a scale from 0 to 5 how do you rate your **level of interest** towards the use of computers in teaching?

NONE	VL	L	M	H	VH
0	1	2	3	4	5

a) If you volunteered, what attracted you to this computer project?

b) If you were selected, how do you feel about this? Why .

4. As a member of professional computer organization to what extent is your involvement in this organization?

NONE	VL	L	M	H	VH
0	1	2	3	4	5

Name of the organization(s)?

Describe the activities or functions of the organization?

- a) For each of the items below, on the scale of 0 to 5 rate the amount of **benefit from being a member** of this organization?

	NONE	VL	L	M	H	VH
1- exposed to new hardware and software	0	1	2	3	4	5
2- attended training in the use of computer	0	1	2	3	4	5
3- solved my problems faced in using computer	0	1	2	3	4	5
4- obtained new ideas on how to integrate computer with subject matters	0	1	2	3	4	5

5. For each of the items below, on a scale from 0 to 5 how do you rate your degree of knowledge of the computer programming?

	NONE	VL	L	M	H	VH
1=basic	0	1	2	3	4	5
2=pascal	0	1	2	3	4	5
3=fortran	0	1	2	3	4	5
4= C- language	0	1	2	3	4	5
5=other _____	0	1	2	3	4	5

(If NONE, skip question 6)

6. How did you learn the programming language(s)?
Please indicate (✓) where applicable)

		Code
(i.e., Self-taught	[]	1
Conference and workshops (on own time)	[]	2
Courses offered by district/at school (inservice)	[]	3
Courses in grad/under grad training	[]	4
Courses offered by school district (not inservice)	[]	5
Instruction from other teachers	[]	6
Instruction on site by consultants	[]	7

7. On a scale from 0 to 5 , rate how much you use computer at home?

NONE	VL	L	M	H	VH
0	1	2	3	4	5

How do you use your home computer ? (Describe)

Probe: Do you use it for job-related purposes/personal?

8. On a scale from 0 to 5 to what extent did you use computer prior to the training?

NONE	VL	L	M	H	VH
0	1	2	3	4	5

Please describe?

9. On the scale from 0 to 5, rate the **amount of training** you had on the use of the computers before the training given by the Ministry of Education?

NONE	VL	L	M	H	VH
0	1	2	3	4	5

Please describe?

10. On a scale from 0 to 5 rate to what extent the **changes in your use of computer** resulted from the training given by the Ministry of Education?

NONE	VL	L	M	H	VH
0	1	2	3	4	5

Please describe the changes in your use?

11. What did you find **most useful** about the training?
(Probe: topics, time, place)

12. What did you find the **least useful** about the training?
(Probe: topics, time, place)

13. On the scale of 0 to 5 how do you rate your **confidence about using the computer** for the first six months after the training?

Not at all	Slightly	Sl-Mod.	Moderately	Mod.-high	Highly
0	1	2	3	4	5

Why?

14. On the scale of 0 to 5 rate how confident are you at present about using the computer in teaching?

Not at all	Slightly	Sl-Mod.	Moderately	Mod.-high	Highly
0	1	2	3	4	5

Please describe if there are any changes from the first six months after the training?

15. For each of the items below, on the scale from 0 to 5 how do you rate the inservice training given by the Ministry in terms of how satisfied you were, how meaningful, and adequate was the training?

	Not at all	Slightly	Sl-Mod.	Moderately	Mod.-high	Highly
a) Satisfaction	0	1	2	3	4	5
b) Meaningfulness	0	1	2	3	4	5
c) Adequacy	0	1	2	3	4	5

Please describe?

a) List features that were especially satisfactory, meaningful or adequate.

b) List features that were not especially satisfactory, meaningful or adequate.

16. On the scale from 0 which is not all all related/fit to 5 which is extremely related/fit how do you rate your the inservice with your own instructional practice?

Not at all	Slightly	Sl-Mod.	Moderately	Mod.-high	Highly
0	1	2	3	4	5

Please describe how?

If not, why?

17. On the scale of 0 to 5 how do you rate the degree of follow-up training given by the ministry / district / school in the past year?

NONE	VL	L	M	H	VH
0	1	2	3	4	5

Please describe (e.g. kinds of training provided,length)?

18. What kind of additional INSERVICE programs do you think would be valuable to you on how to use microcomputers in education?

Probes--features of the optimal inservice program, including:

Content (topics that should and should not be covered):

Location:

Length:

Organizational incentive:

Other (specify):

19. On the scale from 0 to 5 how do you rate the amount of staff development or training on how to use microcomputers in instruction current provided for you by the district or school?

NONE VL L M H VH
0 1 2 3 4 5

- (a) Describe how was it organized?
(Probes---types;
location;
length of training)
(1-[]<10hrs 2-[]10hrs 3-[]20 hrs 4-[]30hrs 5-[]40hrs)

- (b) What topics were covered in the training program(s)?

- (c) Did you participate in this staff development or training? (0=No, 1=Yes)

1. If yes:

- (i) What topics were most helpful to you?

- (ii) What topics were least helpful?

- (d) For each of the items below, on a scale from 1 to 5 how do you evaluate the training or staff development given by your school or district?

	Not at all	Slightly	Sl-Mod.	Moderately	Mod.-high	Highly
a) Successful	0	1	2	3	4	5
b) Relevant	0	1	2	3	4	5
c) Usefulness	0	1	2	3	4	5

Explain and support with example.

20. For each of the items below, on the scale from 0 to 5 how do you rate the amount of continuing support provide for you in using microcomputers in teaching by the school or district?

	NONE	VL	L	M	H	VH
1-[] Technical support:						
a) other teachers (day to day),	0	1	2	3	4	5
b) school computer coordinator/aide	0	1	2	3	4	5
c) district computer coordinator	0	1	2	3	4	5
d) consultants, organized group of teachers	0	1	2	3	4	5
e) software company rep.	0	1	2	3	4	5
f) hardware company rep.	0	1	2	3	4	5
g) resource person	0	1	2	3	4	5
2-[] financial support	0	1	2	3	4	5

Please describe?

- (b) For each of the items below, on the scale 0 to 5 how do you rate the future needs of the following support services?

	NONE	VL	L	M	H	VH
i) Principal support	0	1	2	3	4	5
ii) Technical support	0	1	2	3	4	5
iii) Financial support	0	1	2	3	4	5
Other:						
_____	0	1	2	3	4	5
_____	0	1	2	3	4	5
_____	0	1	2	3	4	5

Please describe?

21. To what extent do you and other CIE teachers in your school get together to discuss issues related to the use of computers in education (i.e. talk about different approach of using computers in teaching, etc.)?

1-[] never 2-[] seldom 3-[] occasionally
4-[] frequently 5-[] very frequently

a) What have you learned?

22. To what extent have you observed other CIE teachers teaching in their classroom?

1-[] never 2-[] 1 time 3-[] 2 times 4-[] 3 times 5-[] 4 times

a) What have you learned from this?

- b) On the scale from 0 to 5 how do you rate the **similarity of their used of computers** compared to the way you used computers in teaching?

NONE	VL	L	M	H	VH
0	1	2	3	4	5

Section 3: Teacher's practices and computer use.

- How many classes do you meet in a typical week?
1-[] 1 classes 2-[] 2-3 classes 3-[] 4-5 classes
4-[] 5-6 classes 5-[] 6 classes
- How many days a week do you meet in the computer lab?
1-[] 1 day 2-[] 2 days 3-[] 3 days 4-[] 4 days 5-[] 5 days
- How many periods do you use the computer lab on a typical day?
1-[] 1 2-[] 2 3-[] 3 4-[] 4 5-[] 5

On what subject(s) matter?

1-[] Math 2-[] Science 3-[] Language 4-[] History
5-[] Geography 6-[] Computer 7-[] Other _____

4. What is the total amount of time(mins.) your classes spend using computers each week?
 1-[] 10-20 2-[] 21-30 3-[] 31-40 4-[] 41-50 5-[] 51-60
5. What subject areas are you teaching?
 1-[] Math 2-[] Science 3-[] Language 4-[] History
 5-[] Geography 6-[] Computer 7-[] Other _____
6. Would you spend more time using computers for instruction? (0=No, 1=Yes)
 If YES, how would you use?

7. For each of the items below, on the scale from 0 to 5 rate the extent that these **factors that prevent** you from spending more time in using computers for instruction?

	Not at all	VL	L	M	H	VH
i) Not enough software	0	1	2	3	4	5
ii) Not enough Hardware	0	1	2	3	4	5
iii) Not enough time to prepare	0	1	2	3	4	5
iv) Lack of computer knowledge	0	1	2	3	4	5
Other: _____	0	1	2	3	4	5
_____	0	1	2	3	4	5
_____	0	1	2	3	4	5
_____	0	1	2	3	4	5

8. What would help you to spend more time using computers in instruction?

9. For each of the items below, on the scale from 0 to 5 rate the extent of your great **concerns** right now about using computers in your practice?

	NONE	VL	L	M	H	VH
i) time-related concerns	0	1	2	3	4	5
ii) software-related concerns	0	1	2	3	4	5
iii) classroom management-related concerns	0	1	2	3	4	5
iv) training/computer knowledge-related concerns	0	1	2	3	4	5
other: _____	0	1	2	3	4	5
_____	0	1	2	3	4	5
_____	0	1	2	3	4	5

- (a) On the scale from 1 to 5 to what extent the inservice training adapted to your concern and needs?

NONE	VL	L	M	H	VH
0	1	2	3	4	5

Please describe?

10. On the scale from 1 to 5 how do you rate the quality of the current software that is available to you?

[] 1 to 2=low [] 3=medium [] 4 to 5=High

11. On the scale from 0 to 5 to what extent have you been able to integrate computers in the content areas?

NONE	VL	L	M	H	VH
0	1	2	3	4	5

Elaborate how you used and give example.

12. For each of the items below, on the scale from 0 to 5, please rate to what extent you have been able to achieve your goal and objective in using the computer in teaching?

NONE	VL	L	M	H	VH
------	----	---	---	---	----

- | | | | | | | |
|--|---|---|---|---|---|---|
| i) Mastery goal e.g. to help to reach basic skill goals; | 0 | 1 | 2 | 3 | 4 | 5 |
| ii) Cognitive e.g. to help to reach problem solving goals; | 0 | 1 | 2 | 3 | 4 | 5 |
| iii) Motivation e.g. to help motivate students; | 0 | 1 | 2 | 3 | 4 | 5 |
| iv) Management e.g. to maintain the orderly classroom such as team work) | 0 | 1 | 2 | 3 | 4 | 5 |

13. In what way or how can you accomplish these goals and objectives? Can you describe and give examples?

14. What are other things(such as hardware, software and etc.) do you would like to have in order for you to be able to accomplish your goals and objectives?

15. What other **future needs** that you think are necessary to help you in using computers in your teaching?
(In the scale of 1 to 5 how do you rate the needs that you have stated)

	VL	L	M	H	VH
i)_____	1	2	3	4	5
ii)_____	1	2	3	4	5
iii)_____	1	2	3	4	5
iv)_____	1	2	3	4	5
_____	1	2	3	4	5

Note: Review Question 1 in part 2

16. What 3 types of software do you use most frequently ?List.
(1=instructional software, 2=application software)

1-[] **Instructional Software:**

- [] Tutorial programs
[] Drill and Practice
[] Problem solving

Other:_____

2-[] **Application Software**

- [] Spell checker
[] Word-processing
[] Record keeping
[] Databases
[] Spreadsheets
[] Chart/Graphing
[] Painting/Drawing

Other(s) _____

17. On the scale from 0 to 5, please rate to what extent have you been able to achieve your goal and objective in using the software you stated above?

	NONE	VL	L	M	H	VH
i) Mastery goal e.g. to help to reach basic skill goals;	0	1	2	3	4	5
ii) Cognitive e.g. to help to reach problem solving goals;	0	1	2	3	4	5
iii) Motivation e.g. to help motivate students;	0	1	2	3	4	5
iv) Management e.g. to maintain the orderly classroom such as team work)	0	1	2	3	4	5

18. For each type describe how you integrate it into your classroom teaching?

19. What are the problems that you have in integrating the software into the classroom?
(In the scale of 1 to 5 how do you rate the problems that you have stated)

	VL	L	M	H	VH
i) _____	1	2	3	4	5
ii) _____	1	2	3	4	5
iii) _____	1	2	3	4	5
iv) _____	1	2	3	4	5
_____	1	2	3	4	5

20. Why did you use these software most frequently?(Note: See Q.16)

21. For each of the items below, on the scale from 1 to 5 how do you rate your current use of the computers in terms of comfort, easy to use , and confident?

	Not at all	Slightly	Sl-Mod	Moderately	Mod.-High	Highly
i) Comfortable	0	1	2	3	4	5
ii) Easy to use	0	1	2	3	4	5
iii) Confident	0	1	2	3	4	5

Explain why?

Note Review Question 2 in part 2

22. Grouping Principles

- a. Do you group your students for computer activities (such as drill and practice; tutorial; etc.) ?

If yes how do you group them

1-[] individually 2-[] in pairs 3-[] in groups of three 4-[] more than three

Why this way?

If not, why not?

- b. On what basis are groups formed(i.e. subject matter ability, computer ability)?
If OTHER, specify basis of grouping.

- c. If students were grouped on the basis of ability or other describe how activities relate to it?
- d. How do you allocate computer time among students or groups of students?
- e. Have your methods of grouping changed as a result of CIE and why ?
Probe: Can you tell me more about CIE effects.
- f. Do students have computer at home? Does this affect what is done in class?
How?

Part 2.

1. Below is software that you might use in your classes. Using the following scale, please indicate by circling the number how frequent ly you use each and at what grade levels.

	0	1	2	3	4	5	
	x-----	x-----	x-----	x-----	x-----	x-----	
	Not available	Never	Infrequently (once or twice) a term	Occasionally (once a week)	Frequently (twice a week)	Regularly (almost every day)	
Application:							
LEVEL(S)							GRADE
Tools:							
Spell checker	0	1	2	3	4	5	_____
Word-processing	0	1	2	3	4	5	_____
Record keeping	0	1	2	3	4	5	_____
Databases	0	1	2	3	4	5	_____
Spreadsheets	0	1	2	3	4	5	_____
Chart/Graphing	0	1	2	3	4	5	_____
Painting/Drawing	0	1	2	3	4	5	_____
Other(s) _____	0	1	2	3	4	5	_____
_____	0	1	2	3	4	5	_____
Programming Language:							
Logo	0	1	2	3	4	5	_____
Basic	0	1	2	3	4	5	_____
Pascal	0	1	2	3	4	5	_____
Other _____	0	1	2	3	4	5	_____
_____	0	1	2	3	4	5	_____
Instructional Software:							
Tutorial programs	0	1	2	3	4	5	_____
Drill and Practice	0	1	2	3	4	5	_____
Problem solving	0	1	2	3	4	5	_____
Games and Simulations:							
Microworlds, simulations	0	1	2	3	4	5	_____
Games	0	1	2	3	4	5	_____
Multimedia:							
Videodisk	0	1	2	3	4	5	_____
Robotics	0	1	2	3	4	5	_____
Other _____	0	1	2	3	4	5	_____
Other _____	0	1	2	3	4	5	_____

2.

Below are some activities that you and the students in your classes might do. Using the following scale please indicate by circling the number how frequently participants engage in each activity.

0	1	2	3	4	5
x-----x-----x-----x-----x-----x					
Not available	Never	Infrequently (once or twice) a term	Occasionally (once a week)	Frequently (twice a week)	Regularly (almost every day)

SCALE						Activity
0	1	2	3	4	5	a) one-way presentation (watch teacher demonstrate a skill or explain an idea)
0	1	2	3	4	5	b) two-way presentation
0	1	2	3	4	5	c) work in groups on tasks
0	1	2	3	4	5	d) work individually on tasks
0	1	2	3	4	5	e) students exploring programs on their own
0	1	2	3	4	5	f) drill & practice
0	1	2	3	4	5	g) direct instruction by computer
0	1	2	3	4	5	h) students making own products
0	1	2	3	4	5	i) remediation
0	1	2	3	4	5	j) game-like drills
0	1	2	3	4	5	k) enrichment
0	1	2	3	4	5	l) databases
0	1	2	3	4	5	m) word processors
0	1	2	3	4	5	n) spreadsheet
0	1	2	3	4	5	o) other _____
0	1	2	3	4	5	_____
0	1	2	3	4	5	_____

(Q. 3)Section 4: *This section is designed to deal with teacher attitudes toward the computer. Please indicate by circling the letter each as to your agreement.*

		3=(N)neutral				
		2=(D) disagree		4=(A) agree		
		1=(SD) strongly disagree		5=(SA) strongly agree		
		1	2	3	4	5
1.	Microcomputers are worthless as instructional tools.	SD	D	N	A	SA
2.	The use of microcomputers can improve the quality of education in our school district.	SD	D	N	A	SA
3.	Microcomputers help students learn.	SD	D	N	A	SA
4.	Microcomputers are too complicated for me to use in my classroom.	SD	D	N	A	SA
✓ 5.	Microcomputers used for instruction will cause more problems than they will solve.	SD	D	N	A	SA
6.	The computer will enable teachers to do a better job.	SD	D	N	A	SA
7.	Implementation of microcomputers for instruction should be encouraged.	SD	D	N	A	SA
✓ 8.	Microcomputers are not better than the traditional methods available.	SD	D	N	A	SA
✓ 9.	I enjoy using innovative techniques in my classroom.	SD	D	N	A	SA
10.	I do not enjoy using a microcomputer.	SD	D	N	A	SA
11.	Students will lose their ability to reason if they let the computers do their work for them.	SD	D	N	A	SA
12.	I have a positive attitude toward the use of computers.	SD	D	N	A	SA
13.	Teachers in this district are not provided with the tangible support needed to use computers in instruction.	SD	D	N	A	SA
14.	Teachers need programming skills in order to use computers.	SD	D	N	A	SA
15.	Students don't need gadgets like computers to teach them "the basics".	SD	D	N	A	SA
16.	I feel frustrated with computers.	SD	D	N	A	SA
17.	I feel excited when using computers.	SD	D	N	A	SA
18.	I feel unsure when using computers to teach.	SD	D	N	A	SA
✓ 19.	Computers make me uncomfortable, irritable or impatient.	SD	D	N	A	SA
20.	I am not interested in computers.	SD	D	N	A	SA

Below are some barriers to the integration of computers into your teaching. Using the following scale please rate by circling the number your PAST (during the first year that you used the lab) and CURRENT barriers.

0 1 2 3 4 5
 x-----x-----x-----x-----x-----x
 Not a barrier minor barrier moderate barrier Barrier (problematic) Considerable barrier major barrier (one of my biggest problem)

Past							Present					
0	1	2	3	4	5	a) The lack of quality software.	0	1	2	3	4	5
0	1	2	3	4	5	b) There is not enough time to develop lessons that use computers.	0	1	2	3	4	5
0	1	2	3	4	5	c) I am not confident with computers.	0	1	2	3	4	5
0	1	2	3	4	5	d) Too little time given for teachers to learn how to use computers.	0	1	2	3	4	5
0	1	2	3	4	5	e) Problems scheduling enough computer time for different teachers' classes.	0	1	2	3	4	5
0	1	2	3	4	5	f) Lack of encouragement from administration.	0	1	2	3	4	5
0	1	2	3	4	5	g) Lack of student interest.	0	1	2	3	4	5
0	1	2	3	4	5	h) My own knowledge of computers is still too weak.	0	1	2	3	4	5
0	1	2	3	4	5	i) Too few computers for the number of children.	0	1	2	3	4	5
0	1	2	3	4	5	j) Too few printers or other peripherals.	0	1	2	3	4	5
0	1	2	3	4	5	k) Not enough time in the school schedule for more computer-based instruction.	0	1	2	3	4	5
0	1	2	3	4	5	l) Not enough help for supervising student computer use.	0	1	2	3	4	5
0	1	2	3	4	5	m) There is lack of funding for software.	0	1	2	3	4	5
0	1	2	3	4	5	n) Inadequate financial support for computers from the school and/or district.	0	1	2	3	4	5
0	1	2	3	4	5	o) Lack of follow-up inservice training.	0	1	2	3	4	5
0	1	2	3	4	5	Other(s) _____	0	1	2	3	4	5

COMPUTER LAB OBSERVATION INSTRUMENT

Instrument 2

School ID Code _____ District _____

Teacher ID Code _____ Grade _____ Subject matter _____

Date _____ Time _____ # Observation _____

Total no. of students in the class: _____ # Male _____ # Female _____

1) Socioeconomic level of class: 1[] Low 2[] Medium 3[] Mixed 4[] High 5[] VH
 Ability level of students: 1[] Low 2[] Medium 3[] Mixed 4[] High 5[] VH

2) Computer's type: 1-[] IBM 2-[] IBM Compat. 3-[] Apple 4-[] Mac
 Describe. (286, 386Sx, 386, etc.)

3) Which of the following **computer devices are available** in the lab? (Check all that apply).

	<u>How many?</u>	<u>Additional description</u>
Microcomputer	[]	
Color Monitor	[]	
Laser Disk player	[]	
CD-ROM	[]	
Projector	[]	
Floppy disk drive	[]	
Graphics plotter	[]	
Hard disk drive	[]	
Joystick/game paddle	[]	
Light pen	[]	
Magnetic tape(including cassette)	[]	
Optical scanner	[]	
Telephone modem	[]	
Printer	[]	
Other _____	[]	

4) What are the subject matter goals/objectives?

5) What are the major content topics that the respondent covers in the class? (List and describe).

6) On the scale of 1 to 5 rate how confident is this teacher in using the computer in teaching?

0-[] Not at all	1-[] Slightly	2-[] Sl-Mod.
3-[] Moderately	4-[] Mod.-High	5-[] Highly

Describe.

7) For each of the items below, on the scale from 0 to 5, rate to what extent this teacher has been able to achieve his/her goal and objective in using the computer in his/her teaching?

	NONE	VL	L	M	H	VH
i) Mastery goal e.g. to help to reach basic skill goals;	0	1	2	3	4	5
ii) Cognitive e.g. to help to reach problem solving goals	0	1	2	3	4	5
iii) Motivation e.g. to help motivate students;	0	1	2	3	4	5
iv) Management e.g. to maintain the orderly classroom such as team work)	0	1	2	3	4	5

8) Rate from 1 to 5 how successful has microcomputer use actually turned out to be with respect to the goals and objectives established for it use?

0-[] Not at all	1-[] Slightly	2-[] Sl-Mod.
3-[] Moderately	4-[] Mod.-High	5-[] Highly

Describe?

9) Process of the procedures occurring during classroom instruction:

- a) teacher control (i.e. presenting information through example and guiding the students) (describe amount and how)
- b) computer control (i.e. CAI -prescription, sequence) (describe amount and how)
- c) student control (amount and how)
- d) Describe the amount of feedback opportunities.
- e) Describe the amount of practice opportunities (student centered).
- f) Other (describe)

10) Describe if teacher used own creativity, different from the textbook or workbook (e.g., teacher-invented activity).

11) Types of softwares used by the teacher:

Application:

Tools:	Spell checker	[]
	Word-processing	[]
	Record keeping	[]
	Databases	[]
	Spreadsheets	[]
	Chart/Graphing	[]
	Painting/Drawing	[]
	Other(s) _____	

Programming

Language:	Logo	[]
	Basic	[]
	Pascal	[]
	Other _____	[]

Instructional Software:

Tutorial programs	[]
Drill and Practice	[]
Problem Solving	[]

Games and Simulations:

Microworlds, simulations including games	[]
---	-----

Multimedia:

Videodisk	[]
Robotics	[]

Other _____	[]
-------------	-----

12) Activity structures occurring during the observation period. (Check all that apply)

Time(min)		
5	10	15
20	25	30
35	40	
_____	[]	a) one-way presentation (watch teacher demonstrate a skill or explain an idea)
_____	[]	b) two-way presentation
_____	[]	c) work in groups on tasks
_____	[]	d) work individually on tasks
_____	[]	e) students exploring programs on their own
_____	[]	f) drill & practice,
_____	[]	g) direct instruction by computer,
_____	[]	h) students making own products,
_____	[]	i) remediation,
_____	[]	j) game-like drills
_____	[]	k) enrichment
_____	[]	l) databases
_____	[]	m) word processors
_____	[]	n) spreadsheet
_____	[]	o) other _____
_____	[]	_____

13) On the scale from 1 to 5 rate to what extent did this teacher integrate computers in the content areas?

NONE	VL	L	M	H	VH
0	1	2	3	4	5

a) Describe the integration of computers by teacher into subject matter?

14) On the scale from 1 to 5 rate teacher's knowledge regarding microcomputer (i.e. hardware, software)?

NONE	VL	L	M	H	VH
0	1	2	3	4	5

a) Describe?

15) On a scale from 0 to 5, rate this teacher level of interest towards the use of computers in teaching?

NONE	VL	L	M	H	VH
0	1	2	3	4	5

Describe?

16) If students are grouped, how many are there in a group?

1-[] individually 2-[] in pairs 3-[] in groups of three 4-[] more than three

a) Describe how were they grouped(i.e computer ability, subject matter ability, other)?

17) How many **students are actually working** with the computer?

0-[]None 1-[]5 2-[]10 3-[]15 4-[]20 5-[]25

a) Describe?

18) How many minutes **students actually worked** with the computer?

1-[]10 2-[]15 3-[]20 4-[]25 5-[]30

19) Describe on **what basis are groups formed**(i.e. subject matter ability, computer ability, or other)

20) If students were grouped on the basis of ability or other describe how activities relate to it?

(Note: NA if not applicable)

20) Describe how **teacher allocated time** (to all uses) with the computer(i.e. -equal time allocated to all users)?

21) Is there an **adult assisting** the teacher?

a) If YES, describe the adult's function.

22) Was the flow of class activities disrupted by interruptions or any unplanned occurrences(e.g., technical usage problems)?

a) If YES, describe disruption and how it was handled.

PANDUAN TEMUDUGA

Bahagian 1

Nama Kod Sekolah _____ Daerah _____

Kod ID.Cikgu _____ Tingkatan _____

Seksi 1: Demografik guru dan sekolah

(A)

1. Kategori sekolah ☐ A ☐ B

2. Jumlah guru

1-☐ 0-20 2-☐ 21-40 3-☐ 41-60 4-☐ 61-80

3. Jumlah pelajar

1-☐ 100-500 2-☐ 501-1000 3-☐ 1001-1500 4-☐ 1501-2000 5-☐ >2000

(B)

4. Jantina: ☐ L ☐ P5. Umur: ☐ <20 ☐ 20-25 ☐ 26-30 ☐ 32-35 ☐ >35

6. Kelulusan akademik tertinggi?

☐ Maktab ☐ Diploma ☐ Ijazah ☐ Sarjana

7. Apakah bidang pengkhususan cikgu?

Major : 1-☐ MathMinor : 1-☐ Math2-☐ Sains2-☐ Sains3-☐ Bahasa3-☐ Bahasa4-☐ Sejarah4-☐ Sejarah5-☐ Ilmu Alam5-☐ Ilmu Alam

Lain-lain _____

Lain-lain _____

8. Pengalaman mengajar sebagai guru terlatih(termasuk tahun ini 1994)

1-☐ 1-5 thn 2-☐ 6-10 thn 3-☐ 11-15 thn 4-☐ 16-20 thn 5-☐ 21-34 thn

9. Pengalaman mengajar di sekolah rendah

1-☐ 1-3 thn 2-☐ 4-6 thn 3-☐ 7-10 thn 4-☐ 11-20 thn 5-☐ 21-35 thn

10. Pengalaman mengajar di sekolah menengah rendah?

1-☐ 1-3 thn 2-☐ 4-6 thn 3-☐ 7-10 thn 4-☐ 11-20 thn 5-☐ 21-35 thn

11. Pengalaman mengajar di sekolah menengah atas?

1-[] 1-3 thn 2-[] 4-6 thn 3-[] 7-10 thn 4-[] 11-20 thn 5-[] 21-35 thn

12. Berapa tahun berpengalaman mengajar Maktab/Institut/Universiti?

1-[] 1-3 thn 2-[] 4-6 thn 3-[] 7-10 thn 4-[] 11-20 thn 5-[] 21-35 thn

Apakah matapelajaran-matapelajaran yang digajar? _____

Arahan:

Di bahagian ini cikgu dikehendaki mengguna skala-skala berikut untuk menjawab soalan-soalan ini.

- 0 = TIADA
- 1 = TERSANGAT RENDAH (TR)
- 2 = RENDAH (R)
- 3 = SEDERHANA (S)
- 4 = TINGGI (T)
- 5 = TERSANGAT TINGGI (TT)

Sebahagian daripada soalan-soalan dibahagian ini cikgu dikehendaki mengguna skala berikut:

- 0 = TIADA
- 1 = SEDIKIT (S)
- 2 = SEDIKIT KE SEDERHANA (S-Sed.)
- 3 = SEDERHANA (Sed.)
- 4 = SEDERHANA KE TINGGI (Sed-T)
- 5 = TINGGI (TT)

Seksi 2. Pengalaman Guru, Sokongan/Bantuan dan Latihan

1. Berapa lamakah cikgu mengajar dengan menggunakan komputer?

1-[] 1 yr. 2-[] 2 yr. 3-[] 3 yr. 4-[] 4 yr. 5-[] 5 yr.

(a) Sejak berapa tahun dahulu cikgu mula berminat dengan komputer?

(a) Sila terangkan sebab utama yang menyebabkan cikgu mula berminat dengan komputer?

2. Tahun berapakah cikgu mula menggunakan komputer?

3. Bagaimana cikgu **menjadi guru KDP**?

1[] Secara sukarela 2[] dipilih oleh pihak sekolah?

Jika diberi skala dari 0 hingga 5 bagaimana cikgu rate **tahap keminatan** cikgu terhadap penggunaan komputer dalam pengajaran?

Tiada	TR	R	S	T	TT
0	1	2	3	4	5

(a) Sekiranya cikgu menawarkan diri secara sukarela, apakah yang telah menarik minat cikgu untuk melibatkan diri dengan projek komputer ini?

(b) Sekiranya cikgu dipilih oleh pihak sekolah, bagaimana perasaan cikgu(gembira, tidak suka dsb.)? Terangkan kenapa begitu?

4. Sebagai ahli dalam organisasi/pertubuhan profesional yang ada kaitan dengan pengkomputeran, sejauh mana penglibatan cikgu dalam organisasi ini?

Tiada	TR	R	S	T	TT
0	1	2	3	4	5

Nyatakan nama organisasi tersebut?

Terangkan aktiviti-aktiviti atau fungsi organisasi/pertubuhan tersebut?

(a) Bagi setiap item di bawah, pada skala 0 hingga 5 nilaikan setakat mana manfaat/faedah yang diperolehi dengan menjadi ahli kepada organisasi/pertubuhan ini.

	Tiada	TR	R	S	T	TT
1- pendedahan kepada program komputer dan alat teknologi yang baru	0	1	2	3	4	5
2- berpeluang untuk menghadiri kursus dalam menggunakan komputer	0	1	2	3	4	5
3- menyelesaikan kebanyakan masalah yang timbul dalam menggunakan komputer	0	1	2	3	4	5
4- memperolehi idea-idea baru dalam menyepadukan komputer dengan pelajaran	0	1	2	3	4	5

5. Bagi setiap item dibawah, pada skala 0 hingga 5 bagaimakah cikgu nilai tahap pengetahuan dalam bahasa pengaturcaraan?

	Tiada	TR	R	S	T	TT
1 - basic	0	1	2	3	4	5
2 - pascal	0	1	2	3	4	5

3 - fortran	0	1	2	3	4	5
4 - bahasa - C	0	1	2	3	4	5
5 - Lain _____	0	1	2	3	4	5

(Jika TIADA, tinggalkan solan 6)

6. Di mana cikgu belajar bahasa pengaturcaraan tersebut?

Belajar sendiri	1-[]
Daripada persidangan dan bengkel(latihan dalam perkhidmatan)	2-[]
Kursus yang ditawarkan oleh daerah sendiri (lat. dlm perkhidm.)	3-[]
Kursus diambil semasa menjadi pelajar di universiti/institusi	4-[]
Kursus yang ditawarkan di sekolah(bukan lat. dlm perkhidmatan)	5-[]
Penerangan dari guru lain	6-[]
Belajar dari perunding komputer	7-[]

7. Pada skala 0 hingga 5 nilaikan setakat mana cikgu mengguna komputer di rumah?

Tiada	TR	R	S	T	TT
0	1	2	3	4	5

a) Terangkan bagaimana cikgu menggunakan komputer dirumah?

Pernahkah cikgu menggunakan untuk membuat kerja yang berkaitan dengan keperluan pengajaran di sekolah?

8. Jika diberi skala dari 0 hingga 5 nilaikan setakat mana cikgu telah menggunakan komputer sebelum menerima kursus/latihan dalam KDP?

Tiada	TR	R	S	T	TT
0	1	2	3	4	5

Terangkan bagaimana?

9. Jika diberi skala dari 0 hingga 5 nilaikan setakat mana cikgu telah mengikuti program atau latihan yang berkaitan dengan penggunaan komputer sebelum mengikuti latihan yang dianjurkan oleh Kementerian Pendidikan(KP)?

Tiada	TR	R	S	T	TT
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0 1 2 3 4 5

Terangkan penglibatan cikgu?

10. Jika diberi skala dari 0 hingga 5 nilaikan setakat mana perubahan cara penggunaan komputer selepas menerima latihan yang diberikan oleh Kementerian Pendidikan (KP)?

Tiada TR R S T TT
0 1 2 3 4 5

Terangkan apakah perubahan cikgu dalam penggunaan komputer?

11. Apakah yang cikgu rasa amat berfaedah daripada latihan/kursus yang di berikan olen KP?

12. Apakah yang anda rasa kurang berfaedah daripadalatihan yang diberikan oleh KP?

(Dari segi: tajuk kursus, masa, tempat)

13. Jika diberi skala dari 0 hingga 5 nilaikan setakat mana keyakinan cikgu dalam penggunaan komputer dalam jangkamasa 6 bulan pertama selepas mendapat latihan dari KP?

TIADA S S-Sed. Sed. Sed-T. TT
0 1 2 3 4 5

Kenapa?

14. Jika diberi skala dari 0 hingga 5 nilaikan setakat mana keyakinan cikgu dalam penggunaan komputer dalam pengajaran sekarang ?

TIADA	S	S-Sed.	Sed.	Sed-T.	TT
0	1	2	3	4	5

Terangkan sebarang perubahan/perbezaan menggunakan komputer selepas 6 bulan cikgu mendapat latihan?

15. Bagi setiap item dibawah, pada skala 0 hingga 5 nilaikan tentang latihan dalam perkhidmatan yang diberikan oleh pihak KP (i.e. cikgu berpuas hati, kurang berpuas hati, berguna, kurang berguna, mencukupi atau tidak mencukupi atau pun latihan tersebut tidak ada kaitan dengan apa yang hendak cikgu gunakan dalam pengajaran?

	TIADA	S	S-Sed.	Sed.	Sed-T.	TT
a) Puas hati	0	1	2	3	4	5
b) Bermakna/berguna	0	1	2	3	4	5
c) Kecukupan	0	1	2	3	4	5

Sila terangkan?

(a) Senaraikan bahagianyang cikgu rasa amat berguna, berpuas hati, bermakna atau pun mencukupi daripada latihan tersebut?

(h) Senaraikan bahagian yang cikgu fikir kurang berguna, berpuas hati, bermakna, atau pun kurang mencukupi daripada latihan tersebut?

16. Bagi setiap item dibawah, pada skala 0 hingga 5 nilaikan setakat mana latihan dalam perkhidmatan yang diberikan oleh pihak KP ini sesuai atau berpadanan dengan penggunaan komputer didalam pengajaran cikgu didalam bilik darjah?

TIADA	S	S-Sed.	Sed.	Sed-T.	TT
0	1	2	3	4	5

(a) Sekiranya ya, terangkan dengan lebih lanjut.

(b) Sekiranya tidak, terangkan mengapa?

17. Jika diberi skala dari 0 hingga 5 nilaikan setakat mana latihan lanjutan penggunaan komputer yang telah diberikan/dianjurkan oleh pihak KP/dacrah/sekolah?

Tiada	TR	R	S	T	TT
0	1	2	3	4	5

Terangkan dengan lanjut jenis latihan yang di berikan.

18. Apakah jenis latihan/program tambahan yang cikgu fikir amat berguna untuk dipelajari berkenaan dengan penggunaan komputer dalam pendidikan?

Isi kandungan latihan(tajuk yang patut disertakan atau dimansuhkan didalam latihan lanjutan ini)

Lokasi latihan

Jenis galakan/dorongan

Jangkamasa latihan

Lain-lain

19. Jika diberi skala dari 0 hingga 5 nilaikan setakat mana pihak sekolah/daerah pernah menyediakan latihan pengembangan kakitangan berkaitan penggunaan komputer dalam pengajaran?

Tiada	TR	R	S	T	TT
0	1	2	3	4	5

(a) Terangkan bagaimana ianya dijalankan?

(jenis latihan, lokasi, jangkamasa latihan)

(1-[]<10hrs 2-[]10hrs 3-[]20 hrs 4-[]30hrs 5-[]40hrs)

(b) Apakah tajuk yang diajar didalam latihan/program ini?

(c) Adakah cikgu melibatkan diri didalam latihan ini?

(1) Jika ada:

(i) Apakah tajuk yang amat berguna pada cikgu?

(ii) Apakah tajuk yang kurang berguna pada cikgu? -

(d) Bagi setiap item dibawah, pada skala 0 hingga 5 nilaikan latihan yang diberikan oleh pihak sekolah/daerah(i.i samada berjaya, berguna, bersesuaian, dsb.)?

	TIADA	S	S-Sed.	Sed.	Sed-T.	TT
a) Berjaya	0	1	2	3	4	5

b) Kesesuaian	0	1	2	3	4	5
c) Berguna	0	1	2	3	4	5

Terangkan dengan lebih lanjut dengan memberi contoh.

20. Bagi setiap item dibawah, pada skala 0 hingga 5 nilaikan setakat mana penyediaan sokongan/bantuan yang berterusan sama ada dari segi kewangan atau teknikal yang diberi kepada cikgu oleh pihak sekolah/daerah dalam penggunaan komputer dalam pengajaran?

	TIADA	TR	R	S	T	TT
1-[] Bantuan teknikal						
a) kumpulan guru-guru(dari hari ke hari)	0	1	2	3	4	5
b) penyelaras komputer sekolah	0	1	2	3	4	5
c) penyelaras komputer daerah	0	1	2	3	4	5
d) penasihat, anjuran dari kumpulan guru	0	1	2	3	4	5
e) nasihat daripada wakil program komputer	0	1	2	3	4	5
f) wakil penjual alatan komputer	0	1	2	3	4	5
g) bantuan dari kakitangan sumber	0	1	2	3	4	5
2-[] Bantuan kewangan	0	1	2	3	4	5
Terangkan dengan lebih lanjut .						

(b) Bagi setiap item dibawah, pada skala 0 hingga 5 nilaikan sokongan/bantuan yang cikgu sendiri inginkan ?

	TIADA	TR	R	S	T	TT
i) Sokongan dari pengetua	0	1	2	3	4	5
ii) Sokongan teknikal	0	1	2	3	4	5
iii) Sokongan kewangan	0	1	2	3	4	5
Lain-lain:						

Lain-lain:

_____	0	1	2	3	4	5
_____	0	1	2	3	4	5
_____	0	1	2	3	4	5

Terangkan?

21. Setakat mana cikgu dan guru-guru KDP yang lain di sekolah membincangkan isu-isu yang berkaitan dengan penggunaan komputer dalam pendidikan(contohnya isu tentang teknik penggunaan komputer dalam pengajaran, dsb)?

- 1-[] Tiada langsung 2-[] Jarang sekali 3-[] kadang-kadang
4-[] selalu 5-[] Kerap sekali

(a) Apa yang dapat cikgu pelajari daripada perbincangan ini?

22. Jika diberi skala dari 0 hingga 5 nilaikan setakat mana cikgu memerhati guru-guru KDP yang lain mengajar dengan bantuan menggunakan komputer?

- 1-[] Tidak pernah 2-[] 1 kali 3-[] 2 kali 4-[] 3 kali 4-[] 5 kali

(a) Apa yang dapat cikgu pelajari daripada pemerhatian ini?

(b) Jika diberi skala dari 0 hingga 5 nilaikan setakat mana cara guru-guru KDP yang lain menggunakan komputer dalam pengajaran sama dengan cara cikgu menggunakannya?

Tiada	TR	R	S	T	TT
0	1	2	3	4	5

Kalau berbeza, nyatakan perbezaannya?

Seksi 3 :Penggunaan komputer dan kelaziman menggunakan komputer.

1. Berapakah **jumlah kelas** yang **cikgu ajar** dalam tempoh seminggu?

- 1-[] 1 klas 2-[] 2-3 klas 3-[] 4-5 klas
4-[] 5-6 klas 5-[] 6 klas

2. Berapa **harikah dalam seminggu** cikgu **menggunakan komputer** didalam pengajaran?

- 1-[] 1 hari 2-[] 2 hari 3-[] 3 hari 4-[] 4 hari 5-[] 5 hari

3. Berapakah **jumlah masa cikgu menggunakan bilik komputer** dalam sehari?

- 1-[] 1 2-[] 2 3-[] 3 4-[] 4 5-[] 5

Nyata matapelajaran yang terbahit?

- 1-[] Math 2-[] Sains 3-[] Bahasa 4-[] Sejarah
5-[] Ilmu Alam 6-[] komputer 7-[] Lain-lain _____

4. Berapakah **jumlah masa penggunaan komputer** yang kelas cikgu ambil dalam tempoh seminggu?

- 1-[] 10-20 2-[] 21-30 3-[] 31-40 4-[] 41-50 5-[] 51-60

5. Apakah **matapelajaran** yang **cikgu ajar**?

- 1-[] Math 2-[] Sains 3-[] Bahasa 4-[] Sejarah
5-[] Ilmu Alam 6-[] komputer 7-[] Lain-lain _____

6. Sanggupkah cikgu meluangkan lebih masa menggunakan komputer didalam pengajaran cikgu?

Sekiranya sanggup, bagaimana cikgu akan menggunakannya?

7. Bagi setiap item dibawah, pada skala dari 0 hingga 5 nilaikan setakat mana **faktor-faktor ini menghalang cikgu daripada meluangkan lebih masa** dalam penggunaan komputer didalam pengajaran cikgu?

	TIADA	TR	R	S	T	TT
i) Kekurangan program komputer	0	1	2	3	4	5
ii) Kekurangan alat(termasuk komputer)	0	1	2	3	4	5
iii) Tidak cukup masa untuk menyediakannya	0	1	2	3	4	5
iv) Kurang pengetahaun komputer	0	1	2	3	4	5
Lain-lain:	0	1	2	3	4	5

_____	0	1	2	3	4	5
_____	0	1	2	3	4	5

8. Apakah faktor yang membolehkan cikgu meluangkan lebih masa didalam penggunaan komputer dalam pengajaran?

9. Bagi setiap item dibawah, pada skala 0 hingga 5 nilaikan setakat mana perkara tersebut membimbangkan cikgu mengenai penggunaan komputer dalam pengajaran cikgu buat masakini?

	TIADA	TR	R	S	T	TT
i) berkaitan dengan masa	0	1	2	3	4	5
ii) berkaitan dengan program komputer	0	1	2	3	4	5
iii) berkaitan dengan pengurusan bilikdarjah	0	1	2	3	4	5
iv) berkaitan kurus/pengetahuan komputer	0	1	2	3	4	5
Lain-lain:						
_____	0	1	2	3	4	5
_____	0	1	2	3	4	5
_____	0	1	2	3	4	5

(a) Jika diberi skala dari 0 hingga 5 nilaikan setakat mana latihan yang telah diberikan berkait rapat dengan apa yang cikgu harapkan atau perlukan ?

Tiada	TR	R	S	T	TT
0	1	2	3	4	5

Terangkan?

10. Jika diberi skala dari 0 hingga 5 nilaikan mutu/kualiti program komputer yang cikgu gunakan pada masa ini?

[] 1-2= Rendah [] 3=Sederhana [] 4-5=Tinggi

11. Jika diber skala dari 0 hingga 5, nilaikan setakat mana cikgu padukan/kaitkan penggunaan komputer di dalam kandungan pengajaran ?

Tiada	TR	R	S	T	TT
0	1	2	3	4	5

Terangkan dengan lebih lanjut bagaimana cikgu gunakan komputer dengan berikan contoh.

12. Bagi setiap item dibawah, pada skala 0 hingga 5 nilaikan setakat mana cikgu **dapat mencapai tujuan dan objektif** cikgu dengan penggunaan komputer dalam pengajaran?

	TIADA	TR	R	S	T	TT
i) Tujuan: Kemahiran (i.i. untuk mencapai kemahiran asas)	0	1	2	3	4	5
ii) Kognitif (i.i. tujuan menyelesaikan masalah)	0	1	2	3	4	5
iii) Motivasi(i.i. mendorong pelajar-pelajar)	0	1	2	3	4	5
iv) Pengurusan(i.i. mengurus bilikdarjah saperti bekerja secara kumpulan)	0	1	2	3	4	5

13. Bagaimana cikgu **dapat menyempurnakan tujuan dan objektif** yang disebutkan di atas.? Terangkan dengan lebih lanjut dengan memberikan contoh?

14. Selain daripada apa yang telah disediakan(alatan, program komputer dsb.), apakah **keperluan lain yang cikgu kehendaki untuk menyempurnakan** tujuan dan objektif pengajaran?

15. Untuk **masa hadapan apakah keperluan** yang cikgu fikirkan penting untuk menolong cikgu menggunakan komputer dalam pengajaran dengan lebih berkesan? (Jika diber skala dari 1 hingga 5 nilaikan setiap keperluan yand cikgu sebutkan)

	TR	R	S	T	TT
i) _____	1	2	3	4	5
ii) _____	1	2	3	4	5
iii) _____	1	2	3	4	5
iv) _____	1	2	3	4	5
_____	1	2	3	4	5
_____	1	2	3	4	5

Nota: Lihat soalan 1 Bahagian 2

16. Nyatakan **3 jenis program komputer** yang kerap cikgu gunakan.

1-[]Program komputer pengajaran

- []Program bimbingan
 []Program latih tubi
 []Penyelesaian masalah

Lain-lain _____

2-[]Pukul-pukul aplikasi:

- []Penyemak ejaan
 []Pemproses perkataan
 []Penyimpan rekod
 []Pengkalan data
 []Hamparan elektronik
 []Penghasilan grafik
 []Pembina lukisan

Lain-lain _____

17. Jika diberi skala dari 0 hingga 5, nilaikan setakat mana cikgu telah mencapai tujuan dan objektif semasa menggunakan program komputer yang di sebutkan di atas?

	TIADA	TR	R	S	T	TT
i) Tujuan: Kemahiran (i.i. untuk mencapai kemahiran asas)	0	1	2	3	4	5
ii) Kognitif (i.i. tujuan menyelesaikan masalah)	0	1	2	3	4	5
iii) Motivasi(i.i. mendorong pelajar-pelajar)	0	1	2	3	4	5
iv) Pengurusan(i.i. mengurus bilikdarjah saperti bekerja secara kumpulan)	0	1	2	3	4	5

18. Bagi setiap program terangkan dengan lebih lanjut bagaimana cikgu memadukan dalam pengajaran didalam bilik darjah?

19. Nyatakan masalah yang timbul apabila cikgu memadukan/menyelitkan program komputer ini dalam pengajaran dibilik darjah?(Jika diberi skala dari 1 hingga 5 nilaikan setiap masalah).

	TR	R	S	T	TT
i) _____	1	2	3	4	5
ii) _____	1	2	3	4	5
iii) _____	1	2	3	4	5
iv) _____	1	2	3	4	5
_____	1	2	3	4	5
_____	1	2	3	4	5

20. Mengapakah cikgu kerap menggunakan program komputer yang disebutkan di atas?(*Lihat Soalan 16*)

21. Bagi setiap item dibawah, pada skala dari 0 hingga 5 nilaikan setakat mana penggunaan komputer masakini cikgu dari segi keselesaan, kemudahan , dan keyakinan menggunakannya?

	TIADA	S	S-Sed.	Sed.	Sed-T.	TT
a) Keselesaan`	0	1	2	3	4	5
b) Kemudahan mengguna komputer	0	1	2	3	4	5
c) Keyakinan	0	1	2	3	4	5

Nota: Lihat soalan 2 , Bahagian 2

22. Prinsip membentuk kumpulan

(a) Dalam kegiatan menggunakan komputer, adakah cikgu membahagikan pelajar-pelajar kepada beberapa kumpulan (contoh; program untuk bimbingan, latih tubi, dsb)?

Sekiranya ada, terangkan bagaimana cikgu membentuknya (contoh; secara perseorangan, berpasangan, 3 orang pelajar dalam satu kumpulan atau lebih)?

1-[] perseorangan 2-[] berpasangan 3-[] 3 orang dalam satu kumpulan
4-[] 4 orang dalam satu kumpulan 5-[] lebih dari 4 orang _____

Kenapa cikgu kumpulan mengikut cara yang disebutkan di atas?

Sekiranya cikgu tidak membahagikan pelajar dalam kumpulan, terangkan mengapa?

(b) Atas dasar/asas apakah cikgu mengumpulkan pelajar (contoh; dari segi kepintaran pelajar dalam matapelajaran yang diajar, kebolehan menggunakan komputer, dsb)?

Sekiranya cikgu menggunakan asas yang lain, sila terangkan?

(c) Sekiranya pelajar dikumpulkan berdasar kebolehan/kepintaran mereka, terangkan bagaimana kegiatan/aktiviti tersebut berkait dengan kebolehan pelajar?

(d) Bagaimana cikgu membahagikan masa untuk setiap pelajar atau kumpulan pelajar?

(e) Adakah cara cikgu membahagikan pelajar kepada kumpulan berubah setelah mendapat latihan dari pihak KP? Terangkan mengapa cikgu menggubahkan cara pembahagian kumpulan?

Terangkan dengan lebih lanjut mengenai kesan daripada latihan yang diberikan?

(f) Adakah pelajar-pelajar mempunyai komputer di rumah? Adakah ini mempengaruhi kegiatan didalam bilik darjah? Bagaimana?

Bahagian 2

1. Dibawah ini disenaraikan program-program komputer yang mungkin cikgu gunakan didalam pengajaran. Dengan membulatkan skala yang disediakan nyatakan kekerapan setiap program dan di tingkatan berapa, ianya digunakan.

0	1	2	3	4	5
o-----o	o-----o	o-----o	o-----o	o-----o	o-----o
Tiada software	tidak pernah	jarang (Satu atau dua kali dlm satu semester)	kadang-kala (Satu kali dalam satu minggu)	kerap (dua kali dlm. seminggu)	selalu (tiap-tiap hari)

Pukul-pukul aplikasi:

Skala

Tingkatan

Penyemak ejaan	0	1	2	3	4	5	_____
Pemproses perkataan	0	1	2	3	4	5	_____
Penyimpan rekod	0	1	2	3	4	5	_____
Pengkalan data	0	1	2	3	4	5	_____
Hampan elektronik	0	1	2	3	4	5	_____
Penghasilan grafik	0	1	2	3	4	5	_____
Pembina lukisan	0	1	2	3	4	5	_____
Lain-lain _____	0	1	2	3	4	5	_____
_____	0	1	2	3	4	5	_____

Bahasa pengaturcaraan

Logo	0	1	2	3	4	5	_____
Basic	0	1	2	3	4	5	_____
Pascal	0	1	2	3	4	5	_____
Cobol	0	1	2	3	4	5	_____

Lain-lain _____	0	1	2	3	4	5	_____
_____	0	1	2	3	4	5	_____

Program komputer pengajaran

Program bimbingan	0	1	2	3	4	5	_____
Program latih tubi	0	1	2	3	4	5	_____
Penyelesaian masalah	0	1	2	3	4	5	_____
Permainan dan Simulasi							
Dunia-mikro, simulasi	0	1	2	3	4	5	_____
Permainan	0	1	2	3	4	5	_____
Multi-media:							
Cakera Video	0	1	2	3	4	5	_____
Robotik	0	1	2	3	4	5	_____
Lain-lain _____	0	1	2	3	4	5	_____
_____	0	1	2	3	4	5	_____

2. Dibawah ini disenaraikan beberapa kegiatan/aktiviti yang mungkin di gunakan oleh cikgu dan pelajar dibilik darjah . Dengan menggunakan skala yang disediakan , tandakan dengan membulatkan nombor untuk menunjukkan kekerapan aktivi-tiaktiviti berikut di jalankan.

0	1	2	3	4	5
x-----x-----x-----x-----x-----x					
Tiada software	tidak pernah	jarang (Satu atau dua kali dlm satu semester)	kadang-kala (Satu kali dalam satu minggu)	kerap (dua kali dlm. seminggu)	selalu (tiap-tiap hari)

SKALA

Aktivi/Kegiatan

0	1	2	3	4	5	a) penyampaian sehal (memerhati guru membuat demonstrasi kemahiran atau menerangkan idea)
0	1	2	3	4	5	b) penyampaian/interaksi dua hala
0	1	2	3	4	5	c) tugas berkumpul
0	1	2	3	4	5	d) tugas individu
0	1	2	3	4	5	e) pelajar menerokai program komputer secara sendiri
0	1	2	3	4	5	f) program latih tubi
0	1	2	3	4	5	g) arahan secara terus dari komputer
0	1	2	3	4	5	h) pelajar membuat hasil sendiri dengan menggunakan komputer
0	1	2	3	4	5	I) mengulangkaji
0	1	2	3	4	5	j) latih tubi dalam bentuk permainan

0	1	2	3	4	5	k) pengayaan
0	1	2	3	4	5	l) pengkalan data
0	1	2	3	4	5	m) pemprosesan perkataan
0	1	2	3	4	5	n) hamparan elektronik
0	1	2	3	4	5	o) Lain -lain_____
0	1	2	3	4	5	_____

(Soalan 3) Seksi 4: *Bagi setiap item dibawah, dengan menggunakan skala yang diberi nilaikan dengan membulatkan skala bagi setiap pernyataan .*

			3=(B) berkecuali		
		2=(TS) tidak setuju	4=(S) setuju		
1=(ATS) amat tidak bersetuju			5=(AS) amat setuju		
	1	2	3	4	5
1. Komputer adalah alat yang tidak berguna sebagai alat bantuan mengajar.	ATS	TB	B	S	AS
2. Penggunaan komputer boleh meningkatkan lagi mutu pendidikan di sekolah	ATS	TB	B	S	AS
3. Komputer dapat menolong didalam pembelajaran pelajar.	ATS	TB	B	S	AS
4. Komputer terlalu sukar untuk saya gunakan didalam pengajaran .	ATS	TB	B	S	AS
5. Penggunaan komputer didalam pengajaran mendatangkan lebih banyak masalah daripada memberi penyelesaian.	ATS	TB	B	S	AS
6. Komputer menolong guru melaksanakan kerja dengan lebih baik.	ATS	TB	B	S	AS
7. Perlaksaanaa komputer untuk mengajar patut digalakkan.	ATS	TB	B	S	AS
8. Tidak ada kelebihan menggunakan komputer jika dibandingkan dengan mengajar cara tradisi(lama).	ATS	TB	B	S	AS
9. Saya memang gemar menggunakan teknik baru dalam pengajaran di bilik darjah saya.	ATS	TB	B	S	AS
10. Saya tidak gemar menggunakan komputer.	ATS	TB	B	S	AS
11. Pelajar akan hilang daya untuk memberi penerangan/alasan jika menggunakan komputer untuk membuat kerja mereka.	ATS	TB	B	S	AS

- | | | | | | |
|---|-----|----|---|---|----|
| 12. Saya mempunyai sikap yang positif terhadap penggunaan komputer. | ATS | TB | B | S | AS |
| 13. Guru di sekolah/daerah ini tidak diberi kemudahan/sokongan yang kuat didalam penggunaan komputer. | ATS | TB | B | S | AS |
| 14. Guru memerlukan kemahiran program pengaturcaraan untuk menggunakan komputer. | ATS | TB | B | S | AS |
| 15. Pelajar tidak perlu alat seperti komputer untuk mengajar mereka perkara yang asas. | ATS | TB | B | S | AS |
| 16. Saya ras kecewa setiap kali menggunakan komputer. | ATS | TB | B | S | AS |
| 17. Saya merasakan sesuatu yang menyeronokan bila menggunakan komputer. | ATS | TB | B | S | AS |
| 18. Saya rasa ragu-ragu bila menggunakan komputer didalam pengajaran saya | ATS | TB | B | S | AS |
| 19. Komputer membuat saya merasa tidak selesa, tidak sabar atau lekas marah. | ATS | TB | B | S | AS |
| 20. Saya tidak berminat dengan komputer. | ATS | TB | B | S | AS |

Dibawah ini disenaraikan beberapa masalah yang menjadi faktor penghalang dalam usaha mengintegrasikan/menyepadukan komputer dalam pengajaran. Dengan menggunakan skala dibawah, nilaikan masalah-masalah yang dianggap halangan masa lepas dan masa kini.

0	1	2	3	4	5
x-----x-----x-----x-----x-----x					
Tiada masalah	masalah yang dianggap kecil	bermasalah (sederhana)	bermasalah	masalah yg. berat	salah satu masalah yang besar
Masalah lepas			Masalah kini		
0	1	2	3	4	5
a) Kurang Mutu/kualiti program komputer.			0 1 2 3 4 5		
0	1	2	3	4	5
b) Tidak cukup masa untuk membuat/mereka pelajaran yang menggunakan komputer			0 1 2 3 4 5		
0	1	2	3	4	5
c) Saya rasa tidak yakin menggunakan komputer.			0 1 2 3 4 5		
0	1	2	3	4	5
d) Masa yang terlalu singkat diberikan kepada guru untuk mempelajari cara menggunakan komputer.			0 1 2 3 4 5		
0	1	2	3	4	5
e) Masalah dalam menyediakan jadual					

							masa komputer yang secukupnya untuk setiap guru kelas.	0	1	2	3	4	5
0	1	2	3	4	5	f)	Kurang galakan dari pentadbir.	0	1	2	3	4	5
0	1	2	3	4	5	g)	Kurang minat dari pihak pelajar	0	1	2	3	4	5
0	1	2	3	4	5	h)	Pengetahuan saya mengenai komputer masih lemah.	0	1	2	3	4	5
0	1	2	3	4	5	i)	Bilangan komputer masih sedikit untuk digunakan oleh bilangan pelajar yang ramai.	0	1	2	3	4	5
0	1	2	3	4	5	j)	Bilangan pencetak atau alat lain yang terlalu sedikit.	0	1	2	3	4	5
0	1	2	3	4	5	k)	Tidak ada cukup masa dalam jadual sekolah untuk menambahkan lagi masa pengajaran komputer.	0	1	2	3	4	5
0	1	2	3	4	5	l)	Tidak cukup penolong/penasihat untuk menolong pelajar tentang cara menggunakan komputer.	0	1	2	3	4	5
0	1	2	3	4	5	m)	Tidak cukup peruntukan untuk membeli program komputer.	0	1	2	3	4	5
0	1	2	3	4	5	n)	Tidak cukup bantuan kewangan untuk pembelian komputer dari pihak sekolah/daerah.	0	1	2	3	4	5
0	1	2	3	4	5	o)	Kurang latihan lanjutan dalam perkhidmatan.	0	1	2	3	4	5

References Cited

APPENDIX B

APPENDIX B**URICHS Approval Letter****MICHIGAN STATE
UNIVERSITY**

June 30, 1994

TO: Norhayati Abdmukti
1416-J Spartan Village
East Lansing, MI 48823

RE: IRB#: 94-285
TITLE: FACTORS RELATED TO TEACHERS' USE OF EDUCATIONAL
TECHNOLOGY IN THE STATE OF SELANGOR, MALAYSIA
REVISION REQUESTED: N/A
CATEGORY: 1-A,C
APPROVAL DATE: 06/30/94

The University Committee on Research Involving Human Subjects' (UCRIHS) review of this project is complete. I am pleased to advise that the rights and welfare of the human subjects appear to be adequately protected and methods to obtain informed consent are appropriate. Therefore, the UCRIHS approved this project including any revision listed above.

RENEWAL: UCRIHS approval is valid for one calendar year, beginning with the approval date shown above. Investigators planning to continue a project beyond one year must use the green renewal form (enclosed with the original approval letter or when a project is renewed) to seek updated certification. There is a maximum of four such expedited renewals possible. Investigators wishing to continue a project beyond that time need to submit it again for complete review.

REVISIONS: UCRIHS must review any changes in procedures involving human subjects, prior to initiation of the change. If this is done at the time of renewal, please use the green renewal form. To revise an approved protocol at any other time during the year, send your written request to the UCRIHS Chair, requesting revised approval and referencing the project's IRB # and title. Include in your request a description of the change and any revised instruments, consent forms or advertisements that are applicable.



OFFICE OF
**RESEARCH
AND
GRADUATE
STUDIES**

University Committee on
Research Involving
Human Subjects
(UCRIHS)

Michigan State University
225 Administration Building
East Lansing, Michigan
48824-1046
517/355-2180
FAX 517/336-1171

**PROBLEMS/
CHANGES:**

Should either of the following arise during the course of the work, investigators must notify UCRIHS promptly: (1) problems (unexpected side effects, complaints, etc.) involving human subjects or (2) changes in the research environment or new information indicating greater risk to the human subjects than existed when the protocol was previously reviewed and approved.

If we can be of any future help, please do not hesitate to contact us at (517)355-2180 or FAX (517)336-1171.

Sincerely,

David E. Wright
David E. Wright, Ph.D.
UCRIHS Chair

DEW:pjm

cc: Leighton Price

APPENDIX C

APPENDIX C**EPRD Approval Letter**

BAHAGIAN PERANCANGAN DAN
PENYELIDIKAN PENDIDIKAN,
KEMENTERIAN PENDIDIKAN,
PARAS 2, 3 DAN 5, BLOK J,
PUSAT BANDAR DAMANSARA,
50604 KUALA LUMPUR

Telefon: 2556900
Kawat: "PENDIDIKAN"
Faks: 03-2554960

Ruj. Tuan:

Ruj. Kami: KP(BPPP)13/15
Tarikh: Jld. 42 (87)
13 April 1994

Puan Norhayati bt. Abd. Mukti
1416 J. Spartan Village,
Michigan State University,
East Lansing, MI 48823
U.S.A

Tuan/Puan,

**Kebenaran Bagi Menjalankan Kajian Ke Sekolah-Sekolah,
Jabatan-Jabatan Dan Institusi-Institusi Di Bawah
Kementerian Pendidikan Malaysia**

Adalah saya diarah untuk memaklumkan bahawa permohonan tuan/puan
menjalankan kajian mengenai

**A Study of Variables Related to Teachers Using Educational
Technology in State of Selangor, Malaysia.**

telah diluluskan.

2. Kelulusan ini adalah berdasarkan kepada hanya apa yang
terkandung di dalam cadangan penyelidikan yang tuan/puan
kemukakan ke Bahagian ini. Kebenaran bagi menggunakan sampel
kajian perlu diperolehi daripada Ketua Bahagian/Pengarah
Pendidikan Negeri yang berkenaan.

3. Tuan/puan juga dikehendaki menghantar senaskhah hasil kajian
tuan/puan ke Bahagian ini sebaik sahaja selesai kelak.

Sekian, terima kasih.

"BERKHIDMAT UNTUK NEGARA"

"CINTAILAH BAHASA KITA"

Saya yang menurut perintah,

(HAJAH FATIMAH BTE MOHAMED)
b.p Pengarah Perancangan dan Penyelidikan Pendidikan,
b.p Pendaftar Besar Sekolah-Sekolah dan Guru-Guru,
Kementerian Pendidikan Malaysia.

APPENDIX D

APPENDIX D

State Education Department Approval Letter



JABATAN PENDIDIKAN,
NEGERI SELANGOR DARUL EHSAN,
TINGKAT BAWAH, 8-11,
WISMA MPSA,
40604 SHAH ALAM

Telefon: 03-5598843

Fax : 03-5502133

✓ Pn. Norhayati bt. Abd. Mukti,
1416 J, Spartan Village,
Michigan State University,
East Lansing, MI 48823,
U.S.A.
Tuan/Puan,

Ruj. Tuan:

Ruj. Kami: Bil. (2) dlm. JFS.41989/21

Tarikh: 30 Jun 1994

KEBENARAN BAGI MENJALANKAN KAJIAN KE SEKOLAH-SEKOLAH

Tajuk: A Study of Variables Related to Teachers Using Educational Technology in State of Selangor, Malaysia

Berdasarkan kepada surat: KP(BPPP) 13/15 Jld. 42 (87)

Bertarikh: 13 April 1994

Adalah saya diarah merujuk kepada surat tuan/puan bertarikh 30 Jun 1994 berhubung dengan perkara di atas dan memaklumkan bahawa Jabatan ini tiada halangan pihak tuan/puan hendak mengadakan kajian tersebut di sekolah / sekolah-sekolah berikut mulai daripada kini hingga selesai :-

- 1- SM Kg. Soeharto, Hulu Selangor
- 2- SMA Simpang Lima, Sabak Bernam
- 3- SM Batu Laut, Kuala Langat
- 4- SM Jeram, Kuala Selangor
- 5- SM Maahad Hamidah, Kajang

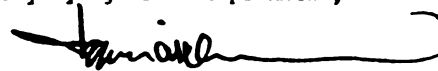
2. Walau bagaimana pun persetujuan dari Pengetua/Guru Besar sekolah terlibat hendaklah diperolehi terlebih dahulu supaya beliau dapat bekerjasama dan seterusnya memastikan bahawa kajian yang dijalankan hanya bertujuan sebagaimana yang tuan/puan nyatakan itu sahaja tanpa melibatkan gangguan terhadap perjalanan sekolah serta tiada unsur-unsur paksaan semasa kajian itu dijalankan.

3. Tuan/Puan adalah diminta menyampaikan senaskah hasil kajian berkenaan ke Jabatan ini sebaik sahaja selesai kelak.

Sekian dimaklumkan.

"BERKHIDMATAN UNTUK NEGARA"

Saya yang menurut perintah,



(HARUN ABU KASSIM)
b.p. Pengasas Sekolah-Sekolah
Negeri Selangor Darul Ehsan.

- s.k.
- 1- Pengarah Jabatan Penuntut Malaysia/America, Chicago.
 - 2- Dekan Fakulti Pendidikan, UKM.
 - 3- PPD berkenaan
 - 4- KPP Teknologi
 - 5- Pengetua Sekolah-sekolah berkenaan.

APPENDIX E

APPENDIX E**Variables that were Omitted**

17 - Involvement in organization(4)

Benefit from the organization:

18 - Exposed to new hardware and software(4a)

19 - Attended training in use of comp.(4a)

20 - Solved problems(4a)

21 - Obtained new ideas to integrate comp. with subject(4a)

Degree of knowledge of comp. programming

24 - FORTRAN(5)

25 - C-Language(5)

26 - Other(5)

56 - Other(20b)

63 - Subject matter (3)

65 - Subject area teaching(5)

81 - Quality of current software(10)

Achieve goal and objectives in using comp.

83 - Mastery(12)

84 - Cognitive(12)

85 - Motivation(12)

86 - Management(12)

Goal and objectives in using stated software:

91 - Mastery(17)

92 - Cognitive(17)

93 - Motivation(17)

94 - Management(17)

Problems integrating software:

96 - Other(19)

97 - Other(19)

98 - Other(19)

APPENDIX F

APPENDIX F

Table 4.4

Descriptive Statistics of All Variables

Variable(GP 1)	Mean	Std Dev	Variance	Min.	Max.	N
LEVINT	3.57	.53	.29	3.0000	4.0000	7
BASIC	2.00	1.63	2.67	.0000	5.0000	7
PASC	.14	.38	.14	.0000	1.0000	7
USECOMHM	2.57	1.99	3.95	.0000	5.0000	7
PRIORTR	2.14	1.46	2.14	.0000	4.0000	7
AMTTRAI	1.57	1.81	3.29	.0000	4.0000	7
CHNGUSEC	2.57	1.62	2.62	.0000	4.0000	7
CONFP	3.00	1.00	1.00	2.0000	5.0000	7
CONFPR	3.57	.79	.62	3.0000	5.0000	7
SATISF	1.86	.90	.81	1.0000	3.0000	7
MEANFUL	3.29	.76	.57	2.0000	4.0000	7
ADEQ	1.29	.49	.24	1.0000	2.0000	7
INSEROWN	3.00	1.41	2.00	1.0000	5.0000	7
FOLLWTRN	1.00	1.15	1.33	.0000	3.0000	7
STAFFDEV	.57	1.13	1.29	.0000	3.0000	7
SUCCEF	2.43	1.13	1.29	1.0000	4.0000	7
RELV	3.57	.79	.62	3.0000	5.0000	7
USEFU	3.00	.82	.67	2.0000	4.0000	7
OTHTEAR	2.29	1.98	3.90	.0000	5.0000	7
SCHCOORD	2.71	1.98	3.90	.0000	5.0000	7
CONSLT	.71	1.25	1.57	.0000	3.0000	7
SOFTWAREP	.71	1.50	2.24	.0000	4.0000	7
HARDWREP	1.29	1.70	2.90	.0000	4.0000	7
RESOURCP	.86	1.21	1.48	.0000	3.0000	7
FINANSUP	1.86	1.35	1.81	.0000	4.0000	7
PRINCIP	2.86	1.57	2.48	1.0000	5.0000	7
TECHNC	4.71	.49	.24	4.0000	5.0000	7
FINANCIA	4.71	.49	.24	4.0000	5.0000	7
ORGNIZSU	2.71	2.56	6.57	.0000	5.0000	7
LABASSIS	4.86	.38	.14	4.0000	5.0000	7
REFBOOKS	4.86	.38	.14	4.0000	5.0000	7
DISCOMIS	3.00	1.41	2.00	1.0000	5.0000	7
OBSRVTEA	2.29	1.38	1.90	1.0000	4.0000	7
SIMILUSE	.43	1.13	1.29	.0000	3.0000	7
CLASSNUM	1.86	.38	.14	1.0000	2.0000	7
DAYS	2.57	1.27	1.62	1.0000	5.0000	7
PERIODLA	2.57	1.13	1.29	1.0000	4.0000	7
MINUSECO	4.14	.90	.81	3.0000	5.0000	7
LACKSFTW	2.43	2.30	5.29	.0000	5.0000	7
LACKHDW	2.29	2.36	5.57	.0000	5.0000	7
LACKTIME	3.43	1.62	2.62	.0000	5.0000	7
LACKKNOW	2.71	1.25	1.57	.0000	4.0000	7
MANYPERI	2.43	2.30	5.29	.0000	5.0000	7

(Cont. table 4.4)

<u>Variable</u>	<u>Mean</u>	<u>Std Dev</u>	<u>Variance</u>	<u>Min.</u>	<u>Max.</u>	<u>N</u>
COMBREAK	2.43	2.37	5.62	.0000	5.0000	7
LABOCCUP	1.14	1.95	3.81	.0000	4.0000	7
TIMECRN	4.29	.76	.57	3.0000	5.0000	7
SOFTWCRN	2.71	2.56	6.57	.0000	5.0000	7
CLSSMGCR	4.71	.76	.57	3.0000	5.0000	7
COMKCRN	3.57	.79	.62	3.0000	5.0000	7
STUDEKNO	.71	1.89	3.57	.0000	5.0000	7
INSOWNCR	2.43	.53	.29	2.0000	3.0000	7
INTEGRCO	1.71	1.50	2.24	.0000	4.0000	7
MORETRN	5.00	.00	.00	5.0000	5.0000	7
COMEACHC	2.86	2.67	7.14	.0000	5.0000	7
SPECLIZT	2.00	2.52	6.33	.0000	5.0000	7
INEXAM	2.14	2.67	7.14	.0000	5.0000	7
ENGLANG	2.00	2.52	6.33	.0000	5.0000	7
COMFORT	3.43	1.62	2.62	.0000	5.0000	7
EASYUSE	3.71	.76	.57	3.0000	5.0000	7
CONFIDEN	4.29	.76	.57	3.0000	5.0000	7
SPELLCHK	1.86	1.21	1.48	1.0000	4.0000	7
WP	3.43	.53	.29	3.0000	4.0000	7
RECDKEEP	1.29	1.38	1.90	.0000	4.0000	7
DB	2.57	1.13	1.29	1.0000	4.0000	7
SPREEDSH	2.43	.98	.95	1.0000	4.0000	7
GRAPH	2.14	1.35	1.81	.0000	4.0000	7
DRAW	2.29	1.38	1.90	1.0000	4.0000	7
OTHERSOF	1.00	.00	.00	1.0000	1.0000	7
BASI	1.14	1.35	1.81	.0000	4.0000	7
TUTORIAL	.86	.90	.81	.0000	2.0000	7
DRILLPRA	.57	.79	.62	.0000	2.0000	7
PROBSOLV	.57	.79	.62	.0000	2.0000	7
MICROWL	.29	.49	.24	.0000	1.0000	7
GAMES	.57	.79	.62	.0000	2.0000	7
ONEWAY	3.57	.53	.29	3.0000	4.0000	7
TWOWAY	3.29	.76	.57	2.0000	4.0000	7
WORKGP	2.14	.90	.81	1.0000	3.0000	7
WORKIND	1.14	.69	.48	.0000	2.0000	7
OWNEXPLO	1.14	.69	.48	.0000	2.0000	7
DRILPRAC	1.57	1.13	1.29	.0000	3.0000	7
COMPINST	1.43	1.40	1.95	.0000	4.0000	7
OWNPRODU	2.00	1.63	2.67	.0000	4.0000	7
REMIAT	1.71	.95	.90	1.0000	3.0000	7
GAMEDRIL	1.43	1.13	1.29	.0000	3.0000	7
ENRICHME	1.57	1.13	1.29	.0000	3.0000	7
DBASE	2.43	1.40	1.95	.0000	4.0000	7
WPROCESS	3.29	.49	.24	3.0000	4.0000	7
SPREEDST	2.29	1.38	1.90	.0000	4.0000	7

Table 4.5
Descriptive Statistics of all Variables

<u>Variable(GP 2)</u>	<u>Mean</u>	<u>Std Dev</u>	<u>Variance</u>	<u>Mini.</u>	<u>Max.</u>	<u>N</u>
LEVINT	3.43	1.27	1.62	1.0000	5.0000	7
BASIC	.71	.76	.57	.0000	2.0000	7
PASC	.43	1.13	1.29	.0000	3.0000	7
USECOMHM	.43	1.13	1.29	.0000	3.0000	7
PRIORTR	1.57	1.51	2.29	.0000	3.0000	7
AMTTRAI	.43	1.13	1.29	.0000	3.0000	7
CHNGUSEC	1.57	1.27	1.62	.0000	3.0000	7
CONFP	2.57	.98	.95	1.0000	4.0000	7
CONFPR	2.86	.90	.81	1.0000	4.0000	7
SATISF	.71	.49	.24	.0000	1.0000	7
MEANFUL	2.00	1.29	1.67	1.0000	4.0000	7
ADEQ	.86	.38	.14	.0000	1.0000	7
INSEROWN	1.86	1.57	2.48	.0000	4.0000	7
FOLLWTRN	1.14	1.07	1.14	.0000	3.0000	7
STAFFDEV	.29	.49	.24	.0000	1.0000	7
SUCCEF	1.86	1.21	1.48	.0000	3.0000	7
RELV	2.14	1.21	1.48	.0000	3.0000	7
USEFU	2.29	1.70	2.90	.0000	4.0000	7
OTHTEAR	2.86	1.77	3.14	1.0000	5.0000	7
SCHCOORD	3.29	1.98	3.90	.0000	5.0000	7
CONSLT	.86	1.86	3.48	.0000	5.0000	7
SOFTWAREP	1.29	1.89	3.57	.0000	5.0000	7
HARDWREP	1.57	1.72	2.95	.0000	5.0000	7
RESOURCP	1.29	1.80	3.24	.0000	5.0000	7
FINANSUP	2.43	1.62	2.62	1.0000	5.0000	7
PRINCIP	3.00	1.73	3.00	1.0000	5.0000	7
TECHNC	4.86	.38	.14	4.0000	5.0000	7
FINANCIA	3.86	.90	.81	3.0000	5.0000	7
ORGNIZSU	3.86	1.77	3.14	.0000	5.0000	7
LABASSIS	3.86	1.77	3.14	.0000	5.0000	7
REFBOOKS	1.57	1.99	3.95	.0000	4.0000	7
DISCOMIS	3.14	1.21	1.48	2.0000	5.0000	7
OBSRVTEA	1.86	1.21	1.48	1.0000	4.0000	7
SIMILUSE	.43	.79	.62	.0000	2.0000	7
CLASSNUM	2.29	1.38	1.90	1.0000	5.0000	7
DAYS	2.43	1.40	1.95	1.0000	5.0000	7
PERIODLA	2.57	.79	.62	2.0000	4.0000	7
MINUSECO	3.86	1.07	1.14	3.0000	5.0000	7
LACKSFTW	1.00	1.53	2.33	.0000	4.0000	7
LACKHDW	.71	.95	.90	.0000	2.0000	7
LACKTIME	3.57	1.13	1.29	2.0000	5.0000	7
LACKKNOW	3.86	.69	.48	3.0000	5.0000	7
MANYPERI	3.29	2.29	5.24	.0000	5.0000	7
COMBREAK	.57	1.51	2.29	.0000	4.0000	7

(Cont. table 4.5)

<u>Variable</u>	<u>Mean</u>	<u>Std Dev</u>	<u>Variance</u>	<u>Min.</u>	<u>Max.</u>	<u>N</u>
TIMECRN	3.43	1.51	2.29	1.0000	5.0000	7
LABOCCUP	.00	.00	.00	.0000	.0000	7
SOFTWCRN	1.43	1.51	2.29	.0000	4.0000	7
CLSSMGCR	4.29	.76	.57	3.0000	5.0000	7
COMKCRN	4.29	.76	.57	3.0000	5.0000	7
STUDEKNO	1.00	1.91	3.67	.0000	5.0000	7
INSOWNCR	1.57	1.51	2.29	.0000	4.0000	7
INTEGRCO	.57	.98	.95	.0000	2.0000	7
MORETRN	4.71	.49	.24	4.0000	5.0000	7
COMEACHC	3.86	1.77	3.14	.0000	5.0000	7
SPECLIZT	2.57	2.44	5.95	.0000	5.0000	7
INEXAM	1.71	2.21	4.90	.0000	5.0000	7
ENGLANG	.57	1.51	2.29	.0000	4.0000	7
COMFORT	2.86	1.35	1.81	1.0000	4.0000	7
EASYUSE	3.00	1.15	1.33	1.0000	4.0000	7
CONFIDEN	2.43	1.40	1.95	1.0000	4.0000	7
SPELLCHK	1.29	.49	.24	1.0000	2.0000	7
WP	3.43	1.27	1.62	1.0000	5.0000	7
RECDKEEP	2.86	1.07	1.14	1.0000	4.0000	7
DB	2.29	.95	.90	1.0000	3.0000	7
SPREEDSH	2.14	1.35	1.81	1.0000	4.0000	7
GRAPH	2.29	1.25	1.57	1.0000	4.0000	7
DRAW	1.71	1.38	1.90	.0000	4.0000	7
OTHERSOF	1.57	.98	.95	1.0000	3.0000	7
BASI	1.14	.38	.14	1.0000	2.0000	7
TUTORIAL	1.57	1.40	1.95	.0000	4.0000	7
DRILLPRA	1.43	1.13	1.29	.0000	3.0000	7
PROBSOLV	.86	1.07	1.14	.0000	3.0000	7
MICROWL	1.00	.82	.67	.0000	2.0000	7
GAMES	.71	.76	.57	.0000	2.0000	7
ONEWAY	3.43	1.27	1.62	1.0000	5.0000	7
TWOWAY	3.57	.79	.62	3.0000	5.0000	7
WORKGP	2.86	1.07	1.14	1.0000	4.0000	7
WORKIND	3.14	1.35	1.81	2.0000	5.0000	7
OWNEXPLO	1.29	.95	.90	.0000	3.0000	7
DRILPRAC	2.14	1.07	1.14	1.0000	3.0000	7
COMPINST	1.57	.79	.62	1.0000	3.0000	7
OWNPRODU	1.86	.90	.81	1.0000	3.0000	7
REMIAT	1.86	1.07	1.14	1.0000	4.0000	7
GAMEDRIL	1.00	.58	.33	.0000	2.0000	7
ENRICHME	2.00	.82	.67	1.0000	3.0000	7
DBASE	2.43	.98	.95	1.0000	4.0000	7
WPROCESS	3.71	.76	.57	3.0000	5.0000	7
SPREEDST	1.86	1.21	1.48	1.0000	4.0000	7

APPENDIX G

APPENDIX G

Statement that deals with attitudes toward the use of computers.

Microcomputers are worthless as instructional tools. (R)

The use of microcomputers can improve the quality of education in our school district.

Microcomputers help students learn.

Microcomputers are too complicated for me to use in my classroom. (R)

Microcomputers used for instruction will cause more problems than they will solve. (R)

Computer will enable teachers to do a better job.

Implementation of microcomputers for instruction should be encouraged.

Microcomputers are not better than the traditional methods available. (R)

I enjoy using innovative techniques in my classroom.

I do not enjoy using a microcomputer. (R)

Students will lose their ability to reason if they let the computers do their work for them. (R)

I have a positive attitude toward the use of computers.

Teachers in this district are not provided with the tangible support needed to use computers in instruction. (R)

(Cont.)

Teachers need programming skills in order to use computers.

Students don't need gadgets like computers to teach them the basic.

I feel frustrated with computers. (R)

I feel excited when using computers.

I feel unsure when using computers to teach. (R)

Computers make me uncomfortable, irritable or impatient. (R)

I am not interested in computers. (R)

Note:

Statement that ends with (R) indicates that when interpreting the data, it will be reflected and score on the opposite direction.

APPENDIX H

PTRAINEE	.3422	.0195	.2343	.0745	-.0973	-.0431	.6509**	.2557	.1637	.4812
AVPCURRU	.0042	.1332	.2808	.4356	.4406	.5307*	.7481**	.0668	.1682	.4458
AVPHINDF	-.6728**	.1419	-.1497	.1785	.4229	.2519	.1539	-.6351*	-.1911	.1599
	TEACHEXP	TEACOMPU	USECHOME	BASICK	USECPKIT	AVCOMK	AMTTTRATT	PINTERES	AVPCONFU	AVPINSEK
AVPSUPPO	-.2864									
AVPNEEDS	.1530	.1200								
PINTEGRC	.7854**	-.2330	.2085							
AVPCONCE	.5774*	.0128	.1006	.2302						
PTRAINEE	.3041	.0314	.1417	.3665	.0459					
AVPCURRU	.4467	-.2141	.5801*	.6300*	.1080	.5812*				
AVPHINDF	.1522	.3339	.4838	-.0324	.3700	.1004	.1467			
	AVPSTAFF	AVPSUPPO	AVPNEEDS	PINTEGRC	AVPCONCE	PTRAINEE	AVPCURRU			

* - Signif. LE .05
computed

** - Signif. LE .01 (2-tailed)

". " is printed if a coefficient cannot be

APPENDIX I

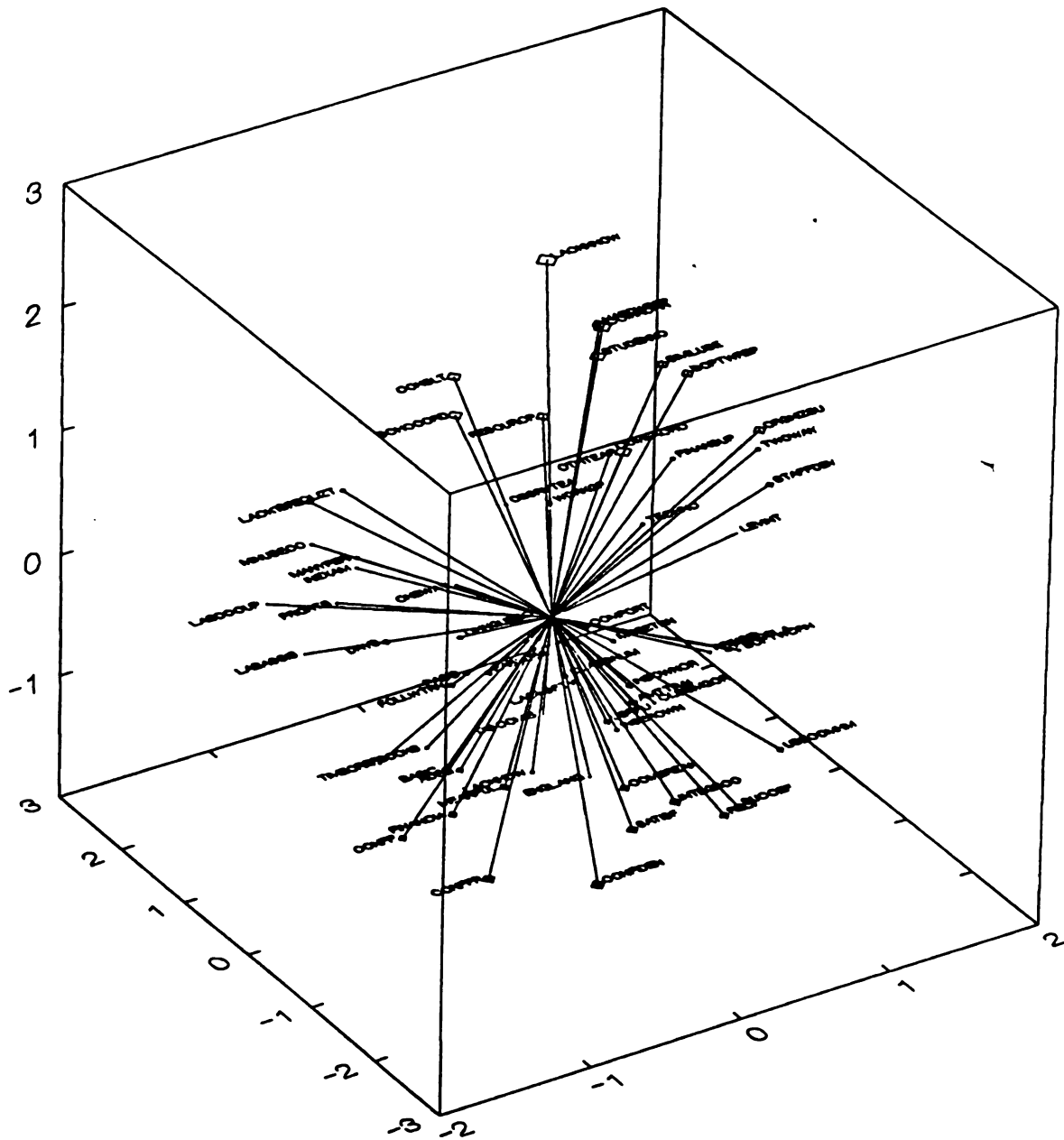


Figure 4.0 3-D Plot of Variables Based on Correlation Matrix

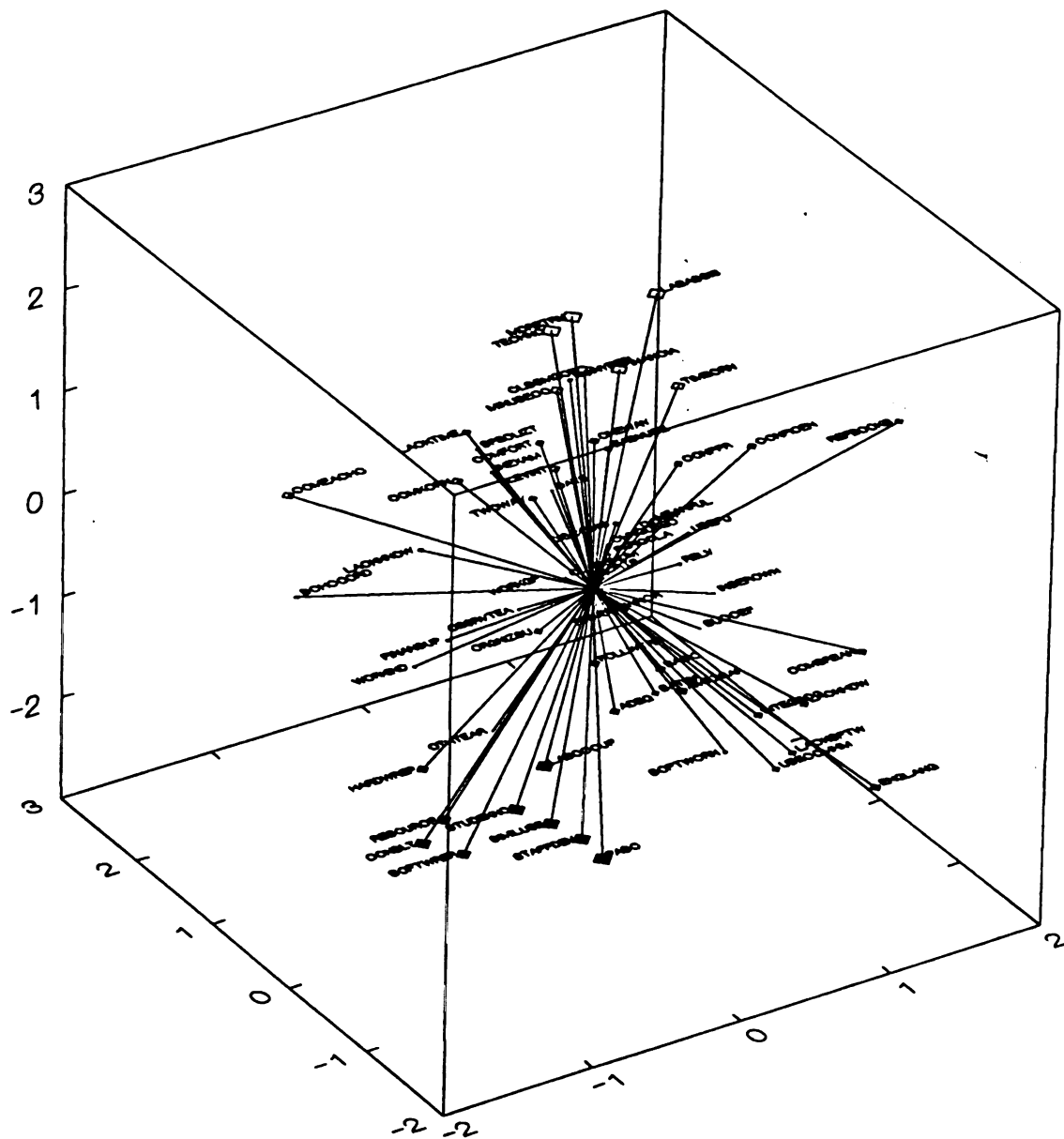


Figure 4.1 3-D Plot of Variables Based on Distance Matrix

APPENDIX J

APPENDIX J**Coordinates of All Teachers**

<u>Variable</u>	<u>Vertical Axis</u>	<u>Left Axis</u>	<u>Right Axis</u>
"A1"	2.260	-.517	1.680
"B1"	-.356	1.918	.548
"C"	-2.730	-1.454	1.584
"D2"	.905	-1.177	-.569
"E2"	-.425	.992	-1.259
"F2"	-.511	.972	-.115
"G2"	.423	-1.364	-.367
"H1"	1.136	.230	-.170
"I1"	.257	.102	.330
"J1"	-.390	.058	.592
"K2"	-1.105	-.619	.148
"L1"	.668	.424	.074
"M2"	.041	-.786	-1.717
"N1"	.975	.778	.218
"O2"	-1.147	.443	-.976

APPENDIX K

APPENDIX K**Coordinates of Similarities Variables for Group 1 Teachers**

<u>Variable</u>	<u>Vertical Axis</u>	<u>Left Axis</u>	<u>Right Axis</u>
"LEVINT"	1.337	.062	-.093
"PASC"	-2.388	-.478	-.186
"FOLLWTRN"	-1.691	.377	.180
"STAFFDEV"	-1.961	-.768	-.160
"PRINCIP"	.806	-1.088	-.632
"TECHNC"	2.665	.150	.187
"DISCOMIS"	.892	-.503	-.807
"SIMILUSE"	-2.167	-.608	-.074
"CLASSNUM"	-.393	-.220	.030
"DAYS"	.126	1.007	-.189
"PERIODLA"	.295	-.394	.597
"LACKTIME"	1.349	.979	-.398
"CLSSMGCR"	2.732	.128	-.460
"MORETRN"	2.979	.317	.111
"SPECLIZT"	-.764	1.685	1.621
"INEXAM"	-.603	2.560	.192
"WP"	1.081	.078	.350
"GRAPH"	-.306	.233	.560
"PROBSOLV"	-1.947	.148	-.506
"GAMES"	-1.994	.015	-.170
"ONEWAY"	1.317	.056	-.088
"REMEDIAT"	-.510	-.401	-.349

(Cont.)

<u>Variable</u>	<u>Vertical Axis</u>	<u>Left Axis</u>	<u>Right Axis</u>
"FINANCIA"	2.673	.233	-.226
"MINUSECO"	1.929	.740	-.090
"MANYPERI"	.103	-.192	1.882
"SPELLCHK"	-.640	.018	-.574
"INSOWNCR"	.074	.112	.108
"SPREEDSH"	.135	.114	-.339
"OWNEXPLO"	-1.149	-.594	-.080
"LABOCCUP"	-1.507	1.384	-1.066

Coordinates of Similarities Variables for Group 2 Teachers

<u>Variable</u>	<u>Vertical Axis</u>	<u>Left Axis</u>	<u>Right Axis</u>
"LEVINT"	1.515	.270	-1.151
"PASC"	-2.299	.017	.081
"FOLLWTRN"	-1.039	-.738	-.285
"STAFFDEV"	-2.123	.205	-.198
"PRINCIP"	.959	1.343	1.121
"TECHNC"	3.177	.372	.079
"DISCOMIS"	1.213	-.077	1.025
"SIMILUSE"	-1.922	-.045	-.553
"CLASSNUM"	.390	-.830	-.444
"DAYS"	.484	-.830	-.508
"PERIODLA"	.526	-.141	-.241
"LACKTIME"	1.726	-.465	.492
"CLSSMGCR"	2.484	.569	.059
"MORETRN"	2.998	.389	-.194
"SPECLIZT"	.969	-2.152	.260
"INEXAM"	-.361	-1.458	-1.456
"WP"	1.762	-.184	-.256
"GRAPH"	.189	.722	.439
"PROBSOLV"	-1.474	-.337	.776
"GAMES"	-1.608	-.285	.434
"ONEWAY"	1.610	-.901	.109
"REMEDIAT"	-.406	.979	.058

(Cont.)

<u>Variable</u>	<u>Vertical Axis</u>	<u>Left Axis</u>	<u>Right Axis</u>
"FINANCIA"	2.062	-.070	.328
"MINUSECO"	1.929	.740	-.090
"MANYPERI"	.103	-.192	1.882
"SPELLCHK"	-.856	-.060	-.019
"INSOWNCR"	-.642	.201	-1.146
"SPREEDSH"	.212	-.265	-.856
"OWNEXPLO"	-.949	-.006	.523
"LABOCCUP"	-2.409	-.102	-.024

Coordinates of All Barriers

<u>Variable</u>	<u>Vertical Axis</u>	<u>Left Axis</u>	<u>Right Axis</u>
"LACQUASF"	.142	-.673	1.195
"LACQUASP"	1.502	.745	.636
"NOTIMDEV"	-1.360	.544	.126
"NOTIMDEP"	-.080	1.227	.456
"NOTCONFC"	-.359	-2.122	.332
"NOTCONFP"	2.283	-1.179	.720
"LITTIMLE"	-.601	-1.750	.032
"LITTIMLP"	1.411	-.855	.735
"PROBSCHE"	-.339	-.057	-1.596
"PROBSCHP"	.848	1.624	-.779
"LACENCOU"	-.173	.624	.453
"LACENCOP"	1.685	1.609	-.021
"STLACINT"	2.186	-1.044	-1.414
"STLACINP"	3.230	-.190	-.522
"OWNKWEAK"	-.687	-.728	.501
"OWNKWEAP"	.911	.432	1.646
"FEWCOMST"	-.536	-.434	-.870
"FEWCOMSP"	1.399	1.387	.212
"FEWPRIPE"	-.780	-.935	-.190
"FEWPRIPP"	.814	-.132	-.557
"NOTIMORC"	-.471	-.265	-.448
"NOTIMORP"	-.106	-.068	-.204

(Cont.)

<u>Variable</u>	<u>Vertical Axis</u>	<u>Left Axis</u>	<u>Right Axis</u>
"NOTENSUS"	-1.161	.031	-.289
"NOTENSUP"	-.807	-.009	.014
"LACKFUNS"	-1.740	.083	.013
"LACKFUNP"	-1.338	.701	.313
"INAFINSU"	-1.658	.358	-.583
"INAFINSP"	-1.344	.938	-.483
"LACFOLLT"	-1.546	-.032	.256
"LACFOLLP"	-1.326	.173	.313

Coordinates of Barriers for Group 1 Teachers

<u>Variable</u>	<u>Vertical Axis</u>	<u>Left Axis</u>	<u>Right Axis</u>
"LACQUASF"	-.236	-.093	1.009
"LACQUASP"	1.386	1.038	.332
"NOTIMDEV"	-.981	.639	.409
"NOTIMDEP"	.352	1.566	-.266
"NOTCONFC"	.266	-2.412	.713
"NOTCONFP"	1.744	-1.643	.710
"LITTIMLE"	-.201	-1.905	-.121
"LITTIMLP"	1.895	-.535	-.747
"PROBSCHE"	-1.269	.016	.714
"PROBSCHP"	.944	1.659	.230
"LACENCOU"	.320	.573	1.831
"LACENCOP"	1.668	1.471	1.194
"STLACINT"	.215	-1.235	-1.176
"STLACINP"	1.923	-.924	-.111
"OWNKWEAK"	-.126	-1.150	.703
"OWNKWEAP"	2.314	.480	-.048
"FEWCOMST"	.083	-.537	-.719
"FEWCOMSP"	1.839	1.112	-1.183
"FEWPRIPE"	-.354	-.557	-.373
"FEWPRIPP"	.146	-.126	-.503
"NOTIMORC"	-.694	-.781	-.203
"NOTIMORP"	-.429	-.523	-.550

(Cont.)

<u>Variable</u>	<u>Vertical</u> <u>Axis</u>	<u>Left</u> <u>Axis</u>	<u>Right</u> <u>Axis</u>
"NOTENSUS"	-1.422	.109	-.068
"NOTENSUP"	-1.178	.255	-.269
"LACKFUNS"	-1.808	.069	.105
"LACKFUNP"	-.709	1.055	-.766
"INAFINSU"	-1.646	.441	-.169
"INAFINSP"	-.790	1.229	-.704
"LACFOLLT"	-1.910	.192	.013
"LACFOLLP"	-1.343	.516	.013

Coordinates of Barriers for Group 2 Teachers

<u>Variable</u>	<u>Vertical Axis</u>	<u>Left Axis</u>	<u>Right Axis</u>
"LACQUASF"	-.444	-1.052	1.343
"LACQUASP"	.961	.704	.327
"NOTIMDEV"	-1.413	.507	-.273
"NOTIMDEP"	-.393	1.274	.067
"NOTCONFC"	-.553	-1.275	.717
"NOTCONFP"	1.726	-.384	1.773
"LITTIMLE"	-.744	-1.390	.732
"LITTIMLP"	.344	-1.344	.290
"PROBSCHE"	1.405	-.784	-1.284
"PROBSCHP"	1.653	-.459	-1.078
"LACENCOU"	-.293	-.257	-.507
"LACENCOP"	1.786	1.210	-.167
"STLACINT"	2.921	-.752	-.558
"STLACINP"	3.587	.193	-.041
"OWNKWEAK"	-1.255	.080	.140
"OWNKWEAP"	-.734	.380	-.792
"FEWCOMST"	-.297	-.288	-1.235
"FEWCOMSP"	.923	1.300	.307
"FEWPRIPE"	-.818	-1.428	.016
"FEWPRIPP"	1.423	1.015	.666
"NOTIMORC"	-.118	.597	.500
"NOTIMORP"	-.002	.731	.455

(Cont.)

<u>Variable</u>	<u>Vertical</u> <u>Axis</u>	<u>Left</u> <u>Axis</u>	<u>Right</u> <u>Axis</u>
"NOTENSUS"	-.740	.290	.309
"NOTENSUP"	-.856	-.114	-.014
"LACKFUNS"	-1.458	.507	-.170
"LACKFUNP"	-1.388	.502	-.268
"INAFINSU"	-1.242	.013	-1.306
"INAFINSP"	-1.070	-.071	-1.415
"LACFOLLT"	-1.435	.398	-.002
"LACFOLLP"	-1.477	-.103	-.119

The Mean Value for Group 1 Barriers

<u>Variable</u>	<u>Mean N</u>
LACQUASF	3.29
LACQUASP	2.14
NOTIMDEV	3.57
NOTIMDEP	2.86
NOTCONFC	3.00
NOTCONFP	1.71
LITTIMLE	3.29
LITTIMLP	2.00
PROBSCHE	4.00
PROBSCHP	2.29
LACENCOU	2.57
LACENCOP	1.86
STLACINT	2.71
STLACINP	1.86
OWNKWEAK	3.14
OWNKWEAP	1.57
FEWCOMST	3.14
FEWCOMSP	2.00
FEWPRIFE	3.43
FEWPRIPP	3.14
NOTIMORC	3.57
NOTIMORP	3.43
NOTENSUS	4.00
NOTENSUP	4.00
LACKFUNS	4.57
LACKFUNP	3.86
INAFINSU	4.29
INAFINSP	3.71
LACFOLLT	4.57
LACFOLLP	4.14

The Mean Value for Group 2 Barriers

Variable	Mean
LACQUASF	3.00
LACQUASP	2.57
NOTIMDEV	4.14
NOTIMDEP	3.43
NOTCONFC	3.43
NOTCONFP	1.57
LITTIMLE	3.71
LITTIMLP	2.71
PROBSCHE	2.14
PROBSCHP	2.00
LACENCOU	3.57
LACENCOP	2.14
STLACINT	1.57
STLACINP	1.00
OWNKWEAK	4.29
OWNKWEAP	3.57
FEWCOMST	3.71
FEWCOMSP	2.86
FEWPRIFE	3.86
FEWPRIPP	2.71
NOTIMORC	3.43
NOTIMORP	3.29
NOTENSUS	3.86
NOTENSUP	3.86
LACKFUNS	4.29
LACKFUNP	4.14
INAFINSU	4.14
INAFINSP	4.00
LACFOLLT	4.43
LACFOLLP	4.29

APPENDIX L

APPENDIX L

Nonparametric-Test of All Variables Between Groups 1 and 2

Variable	Mean Rank		Z value	p value
	Group 1 (n = 7)	Group 2 (n = 7)		
LEVINT	7.43	7.57	-.0700	.9442
BASIC	9.36	5.64	-1.7269	.0842**
PASC	7.43	7.57	-.1048	.9165
USECOMHM	9.64	5.36	-2.1283	.0333**
PRIORTR	8.14	6.86	-.5915	.5542
AMTTRAI	9.00	6.00	-1.5659	.1174
CHNGUSEC	8.93	6.07	-1.3023	.1928
CONFP	8.14	6.86	-.6219	.5340
CONFPR	8.86	6.14	-1.4232	.1547
SATISF	9.93	5.07	-2.4153	.0157**
MEANFUL	9.50	5.50	-1.8731	.0611
ADEQ	8.86	6.14	-1.6927	.0905
INSEROWN	8.93	6.07	-1.2979	.1943
FOLLWTRN	7.14	7.86	-.3353	.7374
STAFFDEV	7.64	7.36	-.1612	.8720
SUCCEF	8.43	6.57	-.8760	.3810
RELV	9.86	5.14	-2.3380	.0194**
USEFU	8.29	6.71	-.7263	.4677
OTHTEAR	6.64	8.36	-.7868	.4314
SCHCOORD	6.57	8.43	-.8583	.3907
CONSLT	7.50	7.50	-.0000	1.000
SOFTWREP	6.86	8.14	-.6711	.5022
HARDWREP	7.00	8.00	-.4683	.6396
RESOURCP	7.07	7.93	-.4119	.6804
FINANSUP	6.86	8.14	-.5922	.5537
PRINCIP	7.29	7.71	-.1960	.8446
TECHNC	7.00	8.00	-.6276	.5302
FINANCIA	9.43	5.57	-1.8752	.0608
ORGNIZSU	6.93	8.07	-.5451	.5857
LABASSIS	9.07	5.93	-1.6630	.0963
REFBOOKS	10.86	4.14	-3.1788	.0015**
DISCOMIS	7.29	7.71	-.1988	.8424
OBSRVTEA	8.14	6.86	-.6187	.5361
SIMILUSE	7.14	7.86	-.4445	.6567
CLASSNUM	7.14	7.86	-.3745	.7080
DAYS	7.79	7.21	-.2660	.7903
PERIODLA	7.43	7.57	-.0689	.9451
MINUSECO	8.07	6.93	-.5563	.5780
LACKSFTW	8.64	6.36	-1.1055	.2689
LACKHDW	8.71	6.29	-1.1671	.2432
LACKTIME	7.50	7.50	-.0000	1.000
LACKKNOW	5.29	9.71	-2.1700	.0300**
MANYPERI	6.50	8.50	-.9480	.3431
COMBREAK	9.07	5.93	-1.6429	.1004
LABOCCUP	8.50	6.50	-1.4720	.1410**
TIMECRN	8.64	6.36	-1.0716	.2839
SOFTWCRN	8.36	6.64	-.7923	.4282
CLSSMGCR	8.79	6.21	-1.3503	.1769
COMKCRN	5.79	9.21	-1.6252	.1041**
STUDEKNO	7.07	7.93	-.5345	.5930

Nonparametric Test of All Variables Between Groups 1 and 2

Variable	Mean Rank		Z value	p value
	Group 1 (n = 6)	Group 2 (n = 8)		
INSOWNCR	8.93	6.07	-1.3252	.1851
INTEGRCO	9.14	5.86	-1.5892	.1120**
MORETRN	8.50	6.50	-1.4720	.1410
COMEACHC	7.36	7.64	-.1389	.8895
SPECLIZT	7.17	7.86	-.3473	.7284
INEXAM	7.93	7.07	-.4303	.6669
ENGLANG	8.64	6.36	-1.2848	.1989
COMFORT	8.57	6.43	-1.0298	.3031
EASYUSE	8.64	6.36	-1.0902	.2756
CONFIDEN	10.14	4.86	-2.4516	.0142**
SPELLCHK	8.29	6.71	-.8240	.4100
WP	7.07	7.93	-.4167	.6769
RECDKEEP	5.29	9.71	-2.0255	.0428**
DB	7.93	7.07	-.3990	.6899
SPREEDSH	8.21	6.79	-.6650	.5061
GRAPH	7.29	7.71	-.1988	.8424
DRAW	8.369	6.64	-.8037	.4216
OTHERSOF	6.50	8.50	-1.4720	.1410
BASI	6.71	8.29	-.8818	.3779
TUTORIAL	6.50	8.50	-.9434	.3455
DRILLPRA	5.86	9.14	-1.5691	.1166**
PROBSOLV	7.00	8.00	-.4900	.6241
MICROWL	5.71	9.29	-1.7523	.0797**
GAMES	7.07	7.93	-.4206	.6741
ONEWAY	7.43	7.57	-.0700	.9442
TWOWAY	7.00	8.00	-.4900	.6241
WORKGP	6.07	8.93	-1.3444	.1788
WORKIND	4.43	10.57	-2.8492	.0044**
OWNEXPLO	7.36	7.64	-.1425	.8867
DRILPRAC	6.50	8.50	-.9723	.3309
COMPINST	7.00	8.00	-.4717	.6371
OWNPRODU	7.71	7.29	-.1976	.8433
REMIAT	7.21	7.79	-.2767	.7820
GAMEDRIL	8.07	6.93	-.5974	.5502
ENRICHME	6.64	8.36	-.8027	.4221
DBASE	7.86	7.14	-.3349	.7377
WPROCESS	6.36	8.64	-1.1638	.2445
SPREEDST	8.21	6.79	-.6626	.5076

**variables that are statistically significant, $p < 0.05$

APPENDIX M

APPENDIX M**Coordinates of Differentiating Variables for Group 1 Teachers**

<u>Variable</u>	<u>Vertical Axis</u>	<u>Left Axis</u>	<u>Right Axis</u>
"BASIC"	-.519	1.031	.514
"USECOMHM"	.582	-1.663	-.573
"PRIORTR"	-.380	1.044	.501
"AMTTRAI"	-1.029	.277	1.321
"CHNGUSEC"	.125	1.056	.744
"CONFP"	.800	-.207	-.460
"CONFPR"	1.400	.014	-.127
"SATISF"	-.363	-.596	.056
"MEANFUL"	1.036	-.075	-.490
"ADEQ"	-1.068	-.274	.085
"INSEROWN"	.963	-1.011	-.367
"SUCCEF"	.226	-.871	.119
"RELV"	1.406	-.394	-.120
"USEFU"	.703	.265	-.293
"OTHTEAR"	.219	-1.433	-.982
"SCHCOORD"	.581	-.023	-1.715
"CONSLT"	-1.900	.719	-.695
"SOFTWREP"	-1.960	-.839	.037
"HARDWREP"	-1.427	.103	.986
"RESOURCP"	-1.732	.238	-.882
"FINANSUP"	-.611	.038	.822
"ORGNIZSU"	.680	-1.383	1.972

(Cont.)

<u>Variable</u>	<u>Vertical Axis</u>	<u>Left Axis</u>	<u>Right Axis</u>
"LABASSIS"	2.811	.355	.061
"REFBOOKS"	2.811	.355	.061
"OBSRVTEA"	-.050	.571	-.764
"LACKSFTW"	.382	-1.964	.732
"LACKHDW"	.089	-.942	-1.852
"LACKKNOW"	.527	.101	-.231
"COMBREAK"	.116	-1.149	1.857
"TIMECRN"	2.215	.192	-.295
"SOFTWCRN"	.769	-2.064	1.146
"COMKCRN"	.364	-.029	-.114
"STUDEKNO"	2.094	.147	1.434
"INTEGRCO"	-.647	-.960	-.444
"ENGLANG"	-.140	-2.458	-.725
"COMFORT"	1.246	1.193	.445
"EASYUSE"	1.414	.444	.162
"CONFIDEN"	2.157	-.126	.493
"COMPINST"	-1.197	.438	-.489
"RECDKEEP"	-1.312	.495	.715
"DB"	.261	.061	.760
"DRAW"	-.135	.419	.947
"OTHERSOF"	-1.341	-.182	-.094
"BASI"	-1.662	-.005	.250
"TUTORIAL"	-1.658	.438	-.343
"DRILLPRA"	-1.947	.148	-.506
"MICROWL"	-2.227	-.302	-.312

(Cont.)

<u>Variable</u>	<u>Vertical</u> <u>Axis</u>	<u>Left</u> <u>Axis</u>	<u>Right</u> <u>Axis</u>
"TWOWAY"	1.015	.162	.331
"WORKGP"	-.134	-.092	-.054
"WORKIND"	-1.214	-.439	.180
"DRILPRAC"	-.920	.049	-.483
"OWNPRODU"	-.507	.570	1.027
"GAMEDRIL"	-1.022	.735	-.459
"ENRICHME"	-.900	.801	-.171
"DBASE"	-.011	.990	.144
"WPROCESS"	.930	.009	.098
"SPREEDST"	-.024	-.149	-1.035

Coordinates of Differentiating Variables for Group 2 Teachers

<u>Variable</u>	<u>Vertical Axis</u>	<u>Left Axis</u>	<u>Right Axis</u>
"BASIC"	-1.601	-.149	.678
"USECOMHM"	-2.056	.904	-.295
"PRIORTR"	-.666	-.899	-.903
"AMTTRAI"	-2.133	-.372	-.335
"CHNGUSEC"	-.454	-.967	.071
"CONFP"	.517	-.545	-.186
"CONFPR"	.834	-.487	.274
"SATISF"	-1.567	-.317	.060
"MEANFUL"	-.079	-.791	-.235
"ADEQ"	-1.363	-.342	.085
"INSEROWN"	-.269	-.241	-1.167
"SUCCEF"	-.424	.357	.746
"RELV"	-.070	.721	.598
"USEFU"	.060	.268	1.437
"OTHTEAR"	.775	1.701	.896
"SCHCOORD"	1.481	.799	-1.804
"CONSLT"	-1.632	1.745	-.444
"SOFTWREP"	-1.130	1.444	-.946
"HARDWREP"	-.777	1.359	-.712
"RESOURCP"	-1.182	1.625	-.353
"FINANSUP"	.345	.871	-1.185
"ORGNIZSU"	.919	1.486	1.320

(Cont.)

<u>Variable</u>	<u>Vertical Axis</u>	<u>Left Axis</u>	<u>Right Axis</u>
"LABASSIS"	2.245	-1.378	.349
"REFBOOKS"	-.876	-1.256	-1.203
"OBSRVTEA"	-.305	-.233	-.223
"LACKSFTW"	-1.496	-.358	1.063
"LACKHWD"	-1.693	-.072	.796
"LACKKNOW"	1.922	.692	.050
"COMBREAK"	-2.086	-.563	-.607
"TIMECRN"	1.653	-.744	.933
"SOFTWCRN"	-1.021	1.482	.035
"COMKCRN"	2.490	.644	-.235
"STUDEKNO"	-1.506	.647	1.609
"INTEGRCO"	-1.878	-.327	-.106
"ENGLANG"	-2.121	-.407	.222
"COMFORT"	.934	-.050	-.866
"EASYUSE"	1.131	-.407	.022
"CONFIDEN"	.390	-.343	1.027
"RECDKEEP"	.884	-.442	.670
"DB"	.253	-.415	-.263
"DRAW"	-.432	-.626	-.771
"OTHERSOF"	-.663	-.185	-.137
"BASI"	-1.009	.021	.055
"TUTORIAL"	-.668	-.035	1.144
"DRILLPRA"	-.807	-.003	.808
"MICROWL"	-1.203	-.351	.600
"TWOWAY"	1.593	.722	-.245

(Cont.)

<u>Variable</u>	<u>Vertical</u> <u>Axis</u>	<u>Left</u> <u>Axis</u>	<u>Right</u> <u>Axis</u>
"WORKGP"	.912	-.160	.509
"WORKIND"	1.193	.796	-.624
"DRILPRAC"	-.110	.764	.526
"COMPINST"	-.613	-.142	-.109
"OWNPRODU"	-.307	.410	-.343
"GAMEDRIL"	-1.245	.049	.102
"ENRICHME"	-.151	-.221	.339
"DBASE"	.391	-.498	-.224
"WPROCESS"	1.748	.696	-.125
"SPREEDST"	-.145	-.683	-.230

APPENDIX N

APPENDIX N

Abbreviation Used in 3-D Plot for Statement that Deals with Barriers in the Use of Computers.

PAST barrier**PRESENT barrier**

LACQUASF	The lack of quality software.	LACQUASP
NOTIMDEV	There is not enough time to develop lessons that use computers.	NOTIMDEP
NOTCONFI	I am not confident with computers.	NOTCONFP
LITTIMLE	Too little time given for teachers to learn how to use computers.	LITTIMLP
PROBSCHE	Problems scheduling enough computer time for different teachers' classes.	PROBSCHP
LACENCOU	Lack of encouragement from administration.	LACENCOP
STLACINT	Lack of student interest.	STLACINP
OWNKWEAK	My own knowledge of computers is still too weak.	OWNKWEAP
FEWCOMST	Too few computers for the number of children.	FEWCOMSP
FEWPRIPP	Too few printers or other peripherals	FEWPRIPP
NOTIMORC	Not enough time in the school schedule for more computer-based instruction	NOTIMORP
NOTENSUS	Not enough help for supervising student computer use.	NOTENSUP
LACKFUNS	There is lack of funding for software	LACKFUNP
INAFINSU	Inadequate financial support for computers from the school and/or district.	INAFINSP
LACFOLLT	Lack of follow-up inservice training.	LACFOLLP

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