To the Graduate Council:

I am submitting herewith a thesis written by Joseph C. Ramsey entitled "Teachers' Perceptions of Student Pairing Methods Used in a Modular Technology Education Setting." I have examined the final paper copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Masters of Science, with a major in Human Resource Development.

Randal Pierce

Randal Pierce, Major Professor

We have read this thesis
And recommend its acceptance:

Vickie Stout

Vickie Stout

Mike Winstead

Mike Winstead

Accepted for the Council:

Vice Provost and Dean of Graduate Studies

TEACHERS' PERCEPTIONS OF STUDENT PAIRING METHODS USED IN A MODULAR TECHNOLOGY EDUCATION SETTING

A Thesis

Presented for the

Masters of Science

Degree

The University of Tennessee, Knoxville

Joseph C. Ramsey

December 2001

ACKNOWLEDGMENTS

I would like to thank all of the individuals that have helped me along the way of obtaining my Masters of Science Degree. There are also people that deserve special recognition. These people have helped me tremendously and without them I would not have been able to achieve this degree.

Firstly, I must mention my parents, Stephan A. Ramsey and Kathy E. Ramsey. These individuals have worked endlessly to bring me to this point. I must also mention my wife, Kristie. It has been a blessing having her as my wife to support and help me along the way.

There are a number of persons that contributed to this document as well as my formal education. The faculty of the Human Resource Department, they have answered numerous questions regarding deadlines, requirements, and other important questions that I have had along the way. They have always had a willingness to help students and provided encouragement that must be recognized.

To my committee, I owe much appreciation to Doctor Pierce, Doctor Winstead, and Doctor Stout. Their guidance has been invaluable. All of them have provided help and encouragement when I had any questions or concerns. Along with these persons I would like to thank all my teachers and instructors. They all were willing to do what they could in order for me to be a successful student.

ABSTRACT

The modular classroom has become a widespread tool that is being used in many middle schools as well as high schools nationwide. Two of the classes affected by the modular setting in the Tennessee Public School System is Foundations of Technology and Diversified Technology. In a modular classroom setting students are required to work in groups of at least two, and together they must complete specific tasks in order to obtain a passing grade. The students must be able to interact with each other in order to complete their assignments before they are allowed to move to the next module. The purpose of this study was to determine values for pairing students with an emphasis on Foundations of Technology and Diversified Technology in the Knox County School System. Foundations of Technology is considered a special area course in middle school and Diversified Technology is an elective course in high school.

This study focused on whether teachers in middle school would pair students differently than teachers in high school, teachers with 0-10 years of teaching experience paired students differently than teachers with 11 or more years teaching experience, and if all teachers would rate certain pairing methods higher. Does the students age, gender, ethnicity, or some other factor affect the teacher's decision about which two students should be paired together? The dependent variable of this study was the test instrument that was in the form of a questionnaire. The independent variable of the study consisted of the population chosen. The general description of the participants in the study was Foundations of Technology and Diversified Technology teachers in the Knox County School System in the 2000, 2001 school year.

The results yielded some significant differences between the way middle school teachers and high school teachers paired students. There were also some significant differences between the way teachers with 0-10 years experience and teachers with 11 or more years experience paired students. A significant difference in the value of some pairing methods compared to other pairing methods was also found.

TABLE OF CONTENTS

Chapter	Page
1 INTRODUCTION	1
2 PROBLEM	3
Purpose	3
Definitions of Terms	4
Rationale	5
Objectives	11
Hypotheses	11
3 REVIEW OF LITERATURE	12
Pairing Students	12
Why Pair Students	12
How to Pair Students	14
Review of Related Literature	18
4 METHODS AND RESEARCH PROCEDURES	20
Population and Sample	20
Subjects	20
Instrumentation	20
Procedure	21
Limitations	21
Data Collection	21
Treatment of Data	22
Summary	22
5 SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS	24
Results	24
Frequency Response	24
Mean	25
Two Sample t-tests by Grade Level	27
Two Sample t-tests by Years of Experience	27
Interpretations	32
Hypotheses	32
Recommendations	33
Instrument	33
Testing and Scoring	33
Laboratory	34
Future of Modular Classrooms	34
REFERENCES	35
APPENDIXES	38

Appendix A Certification of Exemption from Review by IRB Review Involving Human Subjects 39
Appendix B Test Instrument 44
VITA 46

List of Tables

Tables Page

1. Frequency Response 26

2. Mean Testing of Sample Population 28

3. Sample Population of High School VS Middle School 29

4. Sample Population of 0-10 Years VS 11 or More Years Experience 32

CHAPTER 1

INTRODUCTION

For many decades, educators have been searching for better ways of organizing classes in schools. In recent years the modular classroom, which pairs learners has evolved in the vocational area into the subjects of Foundations of Technology and Diversified Technology. Pairing students has become a question in the modular classroom in respect to optimizing the students' potential. No great breakthroughs in regard to pairing have been discovered to set a standard for which to follow. Attempts at heterogeneous and homogeneous pairing have been used but it can easily be seen as flawed.

In a traditional classroom students are placed in individual seats and listen to the instructor lecture for a certain period of time, take notes, and work on individual assignments. Foundations of Technology and Diversified Technology are two classes where students are introduced to the modular setting. The modular classroom consists of two or more students working together to solve problems they would normally solve on their own.

Pairing students can be a powerful tool if used correctly. Teachers should be aware of different techniques that could be used to pair students together. Students could be paired together based on their personality, race, socio-economic factors, intelligence level, computer skills, age, and gender, are only a few pairing techniques that could be

considered. Teachers should take advantage of pairing in order to maximize each students' learning potential.

CHAPTER 2

PROBLEM

Due to modular classrooms becoming more popular in middle schools as well as high schools teachers should be able to effectively pair students together. Pairing should not be overlooked nor taken lightly. Teachers should be aware that there are many ways to pair students in a modular classroom in addition to pairing students in some random order. There is a need to identify effective mechanisms for pairing students in the modular setting of Foundations of Technology and Diversified Technology in order to help each student reach their potential. How can the classes of Foundations of Technology and Diversified Technology be measured to see if certain pairing techniques are being used?

The population of teachers in the Knox County School System is a diverse group. Some of the teachers are older and have more years of experience, went through different teacher education programs, only received certification or did not participate in any teacher education program. Some teachers teach in middle school and others teach in high school. There are many variables to take into consideration when trying to decide how students should be paired in the classes of Foundations of Technology and Diversified Technology in the Knox County School System.

Purpose

The purposes of this study are to:

1. Determine which pairing methods were given higher values by Technology

Education teachers for delivering modular Technology Education.

2. Determine if there were differences in the way high school Technology Education teachers paired students compared to how middle school Technology Education teachers paired students.
3. Determine if there were any differences in the way Technology Education teachers with 0-10 years experience paired students compared to Technology Education teachers with 11 or more years experience paired students.

Some valid questions that educators may be faced with are:

1. Is pairing students sometimes overlooked?
2. Is pairing too difficult?
3. Do teachers know what to look for when pairing students?
4. Are students so diverse that there are no means to determine what two students should be paired together?
5. Do teachers know that pairing can be a valuable tool that can help students?

Definition of Terms

There are a number of terms in this study that may require explanation.

Diversified Technology-a literacy course in technology education designed to challenge students interested in planning technical careers in today's high technological society. This course is designed to provide information and experiences to help all students adapt themselves to the workforce and the changing demands that will be placed on the workforce in the 21st century. It will help all students develop skills in problem

solving, teamwork, time management, computer skills, and help them make valid career decisions (D'Apolito, 1999).

Foundations of Technology-enables students to develop technological literacy skills. The task ahead is to build technology education into the curriculum so that all students become well informed about the nature, powers, and limitations of technology. Integrated academics combined with a hand on program of study that teaches about the development and applications of technology and the effects technology has on individuals, society and the environment (D'Apolito, 1999).

Module-one of a series of standardized components which work together in a system (Nichols, 2001).

Pairing-two things which are similar and used together; something made of two parts which are used together; two persons or animals which live or work together (Nichols, 2001).

Rationale

One of the main reasons Foundations of Technology and Diversified Technology have become such an important issue within the Knox County School System is the lack of training that many young people have when they enter the work force. The skill shortage issue is one of the major factors which has forced a change of opinion about Technology Education because it is so closely linked to issues affecting the unwaged and unemployed (Hunt and Jackson 1992).

Foundations of Technology and Diversified Technology are classes that are intended to help students explore potential career choices. Raizen, Sellwood, Todd, and

Vickers (1995) stated as a school subject, technology education leads to technologically literate citizens and enables young people to consider a wide range of careers in the high-performance workplace, as scientists, mathematicians, engineering technologists, and technicians. The idea that technology should be part of everyone's basic education was first advocated in national projects in the United States and in England and Wales over twenty years ago. Today, however, there are renewed calls from politicians, educators, and employers, arguing that technology education should be a key component of the general education of all young Americans. In order to accomplish this goal students are required to work with a partner exploring different modules to help them decide on a career they may be interested in. Some of the modules offered in Foundations of Technology and Diversified Technology are described in the following paragraphs.

Aerodynamics is a module where students design projects where lift, down-force, drag and wind resistance are important issues. They are also required to construct an airplane and apply the principles learned in the module.

Alternative Energy is a module where students work through a series of assignments exploring energy sources. They learn which energy source would be best for specific applications.

In the module of Automotive Technology students discover the practical insight into the workings of a modern computer controlled automobile. They also learn how computers are used to produce and manufacture certain automobiles.

Basic Electricity shows students the step-by-step the rules that govern electrical circuit design. The module teaches the students basic capacitor identification and instructs them on how to use a volt/ohm meter.

Biomedical Technology introduces the students to a number of assignments that explore the workings of the human body. They explore certain health issues that might affect their lives.

CNC Technology is a module that teaches students the skills required to operate a computer controlled milling machine. They are able to design and manufacture a basic product using the milling machine.

Computer Aided Design takes students through a step by step auto cad program. They are given a professional approach to engineering design on a computer.

Computer Aided Publishing shows students how to produce quality artwork through a number of computer assignments. They are introduced to the basic steps of designing a presentation and are taught how to incorporate the art work into the presentation.

Computer Applications is a module where students work through a series of assignments that will help them understand how computers work. They are introduced to basic computer terminology and are required to assemble certain computer components.

Construction Technology explores a range of construction tasks, with emphasis on; strengths of materials, forces on structures, insulating properties of materials, and effects of vibration on structures. Students are required to construct certain structures and test their load capabilities.

Digital Photography teaches students how digital technology is used. The students are shown how to manipulate digital images and some of the advantages of this technology.

Digital Sound Technology helps students investigate the principles of digitally encoded sound signals. They are taught the advantages and disadvantages of analog and digital signals.

Electronic Communications is a module where students complete assignments involving microwave transmission, radio, telephone, satellite, radar and many other communication techniques. They are shown how each technology is used

Electronics Technology introduces students to the electronic components that form the building blocks of all modern electronic systems. Students complete numerous tasks involving basic electrical components.

In the module of Graphics and Animation students design their own animation sequences as they develop the skills to use the latest computer graphic tools. The module helps the students understand the basic technology behind

Health Management helps students examine the implications of decisions and actions taken by us all on our own health. They are introduced to various practices that may improve their health.

Hydraulics shows students how to interconnect the various hydraulic devices provided, to produce powerful control systems. They also learn the many uses of hydraulics and how people benefit from them.

Industrial control Technology shows students how repetitive tasks are automated in industry. They learn the benefits of automated systems and how this system improves the quality of some products.

Mechanisms is a module where students construct and test a range of mechanisms to evaluate them against design criteria. The students learn the benefits of certain mechanisms and how they can be improved.

Multimedia Production takes students through a series of assignments to produce a multimedia presentation. They must integrate video, audio, and undertake their own multimedia design projects.

Navigation and GPS teaches students the basic steps needed to learn about GPS systems as well as map reading, geography and navigation. They are instructed on how to read longitude, latitude and how to mark a specific area using a hand held gps unit.

Research and Design investigates the potential for frictionless travel, using the magnetic levitation track. Students also learn how drag effects any object in motion.

Space Technology introduces students to the basic principles of physical science that enable rockets to fly. The students are also required to construct a rocket and apply the principles learned in the module in order to make their rocket fly properly.

Video Production is a module that helps students build a range of skills including use of the camcorder, audio recording, story boarding, scripting and assemble editing. The students are then required to produce a 5 minute news cast and 30 second commercial.

In the Knox County School System, the schools offering the classes of Foundations of Technology and Diversified Technology have grown. Every middle school and high school offers these classes as part of their curriculum. The classes have become module oriented over the past few years, which requires teachers to pair students. Galton and Williamson (1992) state that many educators regard group work as essentially problematic and make no assumption that working in groups is in itself an essential element of good primary practice.

Working together has some benefits over working individually. Toseland and Rivas (2001) state that group learning provide vicarious learning opportunities and peer feedback that cannot be replicated in individual learning. Groups give members the opportunity to help each other by being supportive, giving feedback, making suggestions, and providing useful information. Groups can also be very valuable because they enable the members to engage in reality situations that they may be faced with on a day to day basis.

Pairing students in the classes of Foundations of Technology and Diversified Technology is not an easy task. Educators should be equally accessible to all students, irrespective of their gender, their ethnicity, and their social backgrounds. Students should also be provided with "real world" situations, and be prepared for the need for flexible skills in a changing environment (Raizen, Sellwood, Todd, and Vickers 1995). In order for teachers to be able to pair so it could be beneficial to the students, he or she must be aware of the different pairing techniques that could maximize each student's potential.

Objectives

The objectives of this study were to:

1. Determine which pairing methods had the highest value in pairing students in the modular setting of Foundations of Technology and Diversified Technology in the Knox County School System.

2. Determine if there were any differences in values of various pairing methods used by high school Technology Education teachers and middle school Technology Education teachers in a county wide survey.

3. Determine if there were any difference in values of various pairing methods used by Technology Education teachers with 0-10 years experience and teachers with 11 or more years of experience.

Hypotheses

I. Technology Education teachers would rate various pairing methods used for delivering modular Technology Education a higher value than others.

II. High School Technology Education teachers would give some pairing methods higher values for delivering modular Technology Education than middle school Technology Education teachers.

III. Teachers with 11 or more years teaching experience would give some pairing methods higher values for delivering modular Technology Education than teachers with 0-10 years teaching experience.

CHAPTER 3

REVIEW OF LITERATURE

Pairing Students

A wide variety of literatures were reviewed to aid in the research of pairing students. A large quantity of the findings discussed the importance and benefits of pairing students. This information was helpful; however, the purpose of the study was to determine the values of pairing mechanisms for pairing students in a modular classroom. The literature based upon the importance and benefits of grouping students was also not a factor in our study because it is mandated in the Tennessee curriculum for Technology Education that Foundations of Technology and Diversified Technology classrooms contain modules with two individuals paired together (D'Apolito 1999). The most beneficial literature to the study involved actual systems to pair students together.

Why Pair Students

As stated, the literature that contained the "why" behind pairing was not overly beneficial in aiding in the "how" of pairing; however, it did provide supporting evidence for continuing to pair students into modules in Foundations of Technology and Diversified Technology. Both Schmuck and Schmuck (1975) and Olmstead (1974) encourage grouping students because it exerts upon their performance and thinking by forcing two people to work together to complete a specific task. Grouping also allows students to interact, learn, and grow from other students' ideas, backgrounds, and abilities.

Reconstructionists view multicultural education or cultural pluralism as one of the main issues in pairing students. The reason they feel this way is because our society has become a mixture of many cultures. This diversity needs to be used in pairing so that our students are matched with different cultures in school so they have an experience dealing with various cultures prior to placement in the work force. Our schools are a "melting pot" and this melting should include pairing students.

In behaviorism, B.F. Skinner (1971) says that we should have controlled cultural evolution. Too often our approach to education (pairing) is an accidental approach. It is his opinion that we should control behavior through our reinforcements. A very controlled pairing system may contain a good student with a bad student, a higher aptitude student with a lower aptitude student, a younger student with an older student, and thus mold the students through very controlled pairing.

The existentialists Ozmon and Craver (1995) state, "pairing offers a puzzling array of interpretations, so it is often difficult to sort out a consistent set of meanings." It seems the only thing certain about the existentialist is there is nothing that is certain. They display a deep sense of moral reservation about individual responsibility. Existentialism lacks a definition and direction like most other philosophies. To relate this to pairing, the existentialist thinks that any random way of pairing is the correct way. Drawing out of the hat is as good as any controlled method.

The main goal of idealism is to search for the truth. Idealism also explores the concept of character development through personal improvements and discipline is the

route to go. Idealism relates to pairing in the fact that only students who want to achieve should be paired. The best students should be placed together.

Pragmatism comes from the word meaning: "to work." It encourages students to seek out the processes that work the best and capitalize on them. As Ozmon and Craver (1995) state the pragmatist would use the method that works the best. The pragmatist would be constantly working on improving the pairing process. They would never be satisfied with the results and would experiment to try and reach the best possible situation.

Although Tennessee has mandated that teachers pair two students per module in Technology Education, Carnes, Lindbeck, and Griffen (1987) concluded in their study about grouping students in a physics class "the use of different sized groups of students produced no significant results when measuring achievement and retention." Activities in technology education should encourage group goal-setting, task identification, teamwork, shared responsibility, accountability and group evaluation. The program should allow students to form groups of varying sizes depending on the task to be completed and to manage the progress of the group's activities (Wright 1997).

How To Pair Students

Researchers Bouri and Lunn (1969) suggest that grouping should be done according to age. Age grouping is heterogeneous form of ability grouping. About 35 per cent of small schools group according to age. Palmer (1971) concluded that age grouping is the predominant type of grouping in school students through the age of fifteen. It seems from his studies that pairing should have little or no age-span in students.

Differences in physical, mental, and emotional maturity can vary greatly in one or two years of age difference. These differences can cause problems, especially for the younger students to cope and perform at the level of the older students.

Thelen (1967) says that grouping of students is blown out of proportion. That we have made grouping too technical for what it actually is. He states, "If there are 200 children and ten teachers, why not just divide the students into ten groups of 20, and give one group to each teacher?" Without a doubt this method is random grouping. Some of his other arguments are that random pairing is the only fair way to group. His exception to this rule is only if the mechanics of things will not work out. These exceptions would be the separation of the sexes for such things as physical education.

Researchers Borko and Niles (1982), Evans (1985), and Strang (1958) all researched the idea of pairing students into groups with their friends or with students with similar interest. Strang stated, "the presence of many friendship bonds and common interests within a group helps make for group cohesiveness." Strang also points out that teachers must keep their eye on groups containing friends because sometimes these groups may spend too much time socializing instead of staying on task. Pairing students with their friends may be an option for student module placement in Technology Education. The teacher needs to be aware that like all methods of pairing, friendship pairing has its pros and cons. The pros are students are less likely to complain about being paired with their friend (Evans 1985) and do not have as much personality conflicts (Borko and Niles 1982). The biggest con of pairing students with their friends is that they may get side tracked by chatting about their personal lives (Strang 1958).

With classrooms being integrated with students of all types of abilities, it is important to look at the grouping of handicapped students. It is quiet possible to have a student in a Foundations of Technology class or Diversified Technology class that is severely handicapped. How do these students get paired into groups? Researchers Alper and Ryndak (1992) feel that handicapped and non-handicapped students can gain a great deal from working in groups together. The non-handicapped student can serve as a tutor for the handicapped student. Through daily exposure to a variety of shared experiences with students who are handicapped, non-handicapped students have the opportunity to learn many new skills, values, and attitudes about human differences (Mehan, Hertweck, and Meihls 1986).

A majority of the literature found on pairing involves ability grouping. Many educators feel that ability grouping allow students to learn at a higher level than non-ability grouping. Thelen (1967) however says that there is a danger in using ability grouping. He says that this causes an isolation effect. These students become "segregated, de facto, in academic or vocational sequences." This type of segregation is undesirable. It creates a class system in which students learn to think of themselves as either superior or inferior. Admiral Rickover (1977) defends ability grouping saying students of high IQ should not be held back by being placed with a student of a lower IQ. He states, "the child with an IQ of 70 should not be placed with the student who has an IQ of 170." Ability grouping actually serves neither student with the proper learning environment.

The Svensson (1962) report shows through a study that mathematically, ability grouping is better in most cases. The differences that were found seemed to grow smaller as the students advanced in the grades.

Borg's (1966) research project determines the effects of ability grouping versus non-ability grouping. The study uses the California Achievement Test Battery (CAT), to measure all the students involved and divided them according to their test scores. The study concluded that superior students learned the most in ability grouping, average students learned some what more than random grouped average students, and slow students actually learned less in ability grouping and more in random grouping.

Ryan (1927) studied grouping and found that one of the reasons school systems like to use grouping is for the cost cutting effort over individual instruction. They also found other advantages to using this method. Some of these advantages are the stimulation of creativeness, social factors, interdependence, mechanical advantages, better organization, easier grading, and overall higher learning.

Elliott (1976) states, "Mixed ability teaching takes place when a teacher tries to regulate his treatment of individual differences by the principle of equality." Mixed ability grouping stresses the importance of the individual. All students deserve the same level of respect. Ability grouping on the other hand tends to band students and treats them as a block. Elliott (1976) quoted, "Streaming or banding merely disguises and ignores differences in abilities and rates of progress and equally presents the problems (often unrecognized) of stretching the brightest pupils and maintaining the understanding

of the less able in the class. Mixed ability classes force teachers to recognize these problems."

Ability grouping, "generally implies grouping students for instructional activities by ability or achievement to create the greatest amount of homogeneity among learners," Slavin (1987). Ability grouping can be used as a mechanism to pair students to modules in Technology Education. There are two routes that can be taken when breaking students into groups based upon their intellectual ability: putting students with same ability into one group and placing students with various ranges of ability in a group. A Technology Education teacher can mix the module pairs based upon what may work best with the particular students involved. Some circumstances may call for a student with a higher ability to tutor and assist a student with a lower ability. If one module is more advanced than others, it might be a good idea to place a pair of students with high abilities together (Manning and Lucking 1990). Wagner, Smith, and Kopf (1996) encourages a teacher to place more advanced students with beginners for hands-on activities.

Review of Related Literature

The literature presented provides little evidence that much research has been done beyond ability grouping, and almost none has been done on effective mechanisms for pairing students. It is agreed that improvement in this area is needed, but no person or group of people have successfully provided any information on how pairing should be done. Numerous areas, including Foundations of Technology and Diversified Technology could benefit from a guide to successfully pairing students together. The literature suggests that the best system for pairing depended on students individually.

Pairing friends may be good for some individuals while pairing students based upon their ability may be more useful for others. There is no question that guidance in pairing students in a modular setting is needed in order to help modular classrooms become more successful.

CHAPTER 4

METHODS AND RESEARCH PROCEDURES

Population and Sample

Subjects

The population consisted of 17 high school teachers and 16 middle school teachers that taught Diversified Technology and Foundations of Technology in the Knox County School System during the spring semester of 2001. Each teacher was certified by the state to teach Foundations of Technology and Diversified Technology in the Knox County School Systems. The subjects ranged in years of experience from 1 year to 16 or more years experience and all of the subjects taught or had taught in a modular setting. A human subjects form was completed in order to test the subjects (see appendix).

Instrumentation

A pilot questionnaire was developed and given to administrators of the Knox County School System and to professors at the University of Tennessee for professional feedback in determining which questions should be considered valid (see appendix). The pilot was narrowed down to 21 questions that would be used as the test instrument. It was also decided the questions would be answered by circling no value, low value, moderate value, and high value. A pilot survey was given to professional educators at the Fall Symposium at Camp Clements in Doyle Tennessee during the fall semester of 2000. This was done in order to make sure that the instrument to be used was clear and

understandable. It was decided that the 21 questions were clear and understandable and would be used for the study. The make-up of the questionnaire was as follows.

1. Personal experience of the teacher was covered by the first 3 questions.
2. Possible ways students in a modular setting could be paired made up the remaining 18 questions.

Procedure

All of the teachers met during a county-wide training and development session at West Valley Middle School in Knoxville Tennessee during the spring semester of 2001. After the training and development session was over the teachers were informed of the study and asked to participate. All of the teachers agreed to be part of the study and each teacher was given a questionnaire in which they had 20 minutes to complete.

Limitations

There was no control group. Subjects were an intact purposeful sample chosen based Knox County certification 470. By using intact groups, internal bias during the selection process was eliminated. Each educator received the same questionnaire and was given the same amount of time to complete the survey. The researcher was a Diversified Technology Teacher in the Knox County School System. Additionally, unknown variables may have reacted on the results of the questionnaire. Factors such as few educators with limited experience were beyond the control of this study.

Data Collection

The data collected came from answers corresponding to the questions of the sample population. The names of the sample population were not on the questionnaire to

ensure anonymity. Data were sorted by Middle School or High School and years of experience, ranging from 0-10 years and 11 or more years.

Treatment of Data

Because the answers to the questions were answered based on ranking a likert scale of 1-4 was used. Each test answer of high value was given a score of 4, answers of moderate value was given a score of 3, answers of low value was give a score of 2, and answers of no value was given a score of 1. This was done in order to derive a numerical value to each of the questions in order for the calculations to be made. The frequency, mean, and standard deviation was then calculated in order to perform the two sample t-test to determine if any of the answers were significantly different.

Summary

A pilot survey was administered to professional educators at Camp Clements in Doyle Tennessee in order to make certain the survey was a valid test instrument. It was decided after piloting the test instrument that is was valid. The population chosen consisted of the combined educators in the Knox County School System that had modular classrooms and had certification 470. The 21 question survey, designed to rate possible pairing ideas in a modular setting was administered. The survey contained 3 questions based on personal experience and the remaining 18 were possible pairing techniques that may be used in a modular classroom setting.

Survey results were evaluated to determine values of pairing techniques. This gave indication of whether educators rated certain pairing mechanisms higher than others. After the test instruments were collected the answers were assigned numerical values in

order to determine frequency, mean, and standard deviation in order to perform two sample t-tests. The data was then categorized by middle school, high school, and years of experience.

CHAPTER 5

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Results

Preliminary statistical analysis was performed used to perform the calculations. The types of analyses included.

(1) Results of test instrument

  (a) Frequency response

  (b) Mean response

(2) 2 sample t-test by grade level (high school teachers vs. middle school teachers)

(3) 2 sample t-test by years of experience (0-10 years experience vs. 11 or more years experience)

Frequency Response

A frequency table showing the number of times teachers responded to each pairing technique was compiled. By comparing the data from the frequency table, pairing students by placing lower level students with upper level students, pairing students randomly, pairing students by placing less motivated students with highly motivated students, and pairing students with computer experience with students who do not have computer experience received the most number of responses in the high value and moderate value columns.

Pairing students by placing lower level students with upper level students received a high value of 8 and a moderate value 19. This calculates to be an 82 percent frequency response (Table 1). Pairing students randomly received a high value of 5 and a moderate value of 21. This calculates to be a 79 percent frequency response (Table 1). Pairing students by placing less motivated students with highly motivated students received a high value of 4 and a moderate value of 21. This calculates to be a 76 percent frequency response (Table1). Pairing extroverted students with introverted students received a high value of 0 and a moderate value of 21. This calculates to be a 64 percent frequency response (Table 1). Pairing students with computer experience with students who do not have computer experience received a high value of 11 and a moderate value of 13. This calculates to be a 76 percent frequency response (Table 1).

Mean

To calculate a statistical mean numerical values were assigned to the responses on the test instrument. Each high value answer received a score of 4, moderate value answers received a score of 3, low value answers received a score of 2, and no value answers received a score of 1. Assigning values to the answers enabled the mean to be calculated based on the likert scale from 1-4 with 4 being the highest value. Four pairing techniques received a score of 2.75 or higher. Pairing students by placing lower level students with upper level students received a mean of 2.934. Pairing students randomly received a mean of 2.881. Pairing students by placing less motivated students with highly motivated students received a mean of 2.934. Pairing by placing students with computer experience with students who do not have computer experience received a mean of 3.029.

Table 1

Frequency Response

Questions 4-21 on test instrument	High Value	Moderate Value	Low Value	No Value
4. Based on characteristics of their personality.	3	14	10	6
5. Allowing them to choose their partner.	2	10	16	5
6. Based upon their race.	0	2	6	25
7. Based on a beginning classroom assignment.	5	10	9	9
8. Based on socio-economic factors.	0	1	8	21
9. Placing lower level with upper level students.	8	19	6	0
10. Surveying them to determine what they like.	9	9	11	4
11. Should be paired randomly	5	21	5	2
12. Paired based upon their intellectual ability.	3	13	13	4
13. Paired based upon their physical ability.	3	6	9	15
14. Less motivated with highly motivated students.	4	21	7	1
15. Paired based upon standard test scores.	2	6	11	14
16. Pairing gifted students together.	5	7	9	12
17. Paired based upon gender.	0	5	9	19
18. Pairing students with different interests.	3	9	19	2
19. Unpopular paired with popular students.	2	8	13	10
20. Extroverted paired with introverted students.	0	21	10	2
21. Based upon computer experience.	11	13	7	2

Two sample t-test by grade level

A two sample t-test was used to determine if there were any differences in the value of pairing techniques of high school compared to that of middle school. A p-value of .05 was used to determine statistical significance. The high school and middle school cohort only showed a difference in pairing mechanisms regarding three pairing techniques. Pairing students based upon the characteristics of their personality received a mean value of 2.647 from high school teachers and a mean value of 2.188 from middle school teachers (Table 3). Pairing students based upon a beginning classroom assignment received a mean value of 2.529 from high school teachers and a mean value of 2.125 from middle school teachers (Table 3). The final pairing technique that was of considerable difference was surveying students to determine what they wanted to take. High school teachers had a mean value of 2.471 and middle school teachers had a mean value of 2.938 (Table 3). There was no significant difference in the overall means using the two sample t-test to determine if high school teachers and middle school teachers gave higher values to certain pairing methods.

Two sample t-test by years of experience

A two sample t-test was used to determine were any differences between teachers with 0-10 years teaching experience compared to teachers that had 11 or more years teaching experience. A p-value of 0.05 was used to determine statistical significance. Teachers with 0-10 years experience and teachers with 11 or more years teaching experience showed a difference in eight pairing techniques. Pairing students based upon a beginning classroom assignment received a mean value of 2.625 from teachers with

Table 2

Mean Testing of Sample Population

Questions 4-21 on test instrument	Total mean	
4. Based on characteristics of their personality.	2.418	
5. Allowing them to choose their partner.	2.261	
6. Based upon their race.	1.304	*
7. Based on a beginning classroom assignment.	2.327	
8. Based on socio-economic factors.	1.302	*
9. Placing lower level with upper level students.	3.102	*
10. Surveying them to determine what they like.	2.705	*
11. Should be paired randomly	2.881	*
12. Paired based upon their intellectual ability.	2.452	
13. Paired based upon their physical ability.	1.881	*
14. Less motivated with highly motivated students.	2.934	*
15. Paired based upon standard test scores.	1.874	*
16. Pairing gifted students together.	2.149	*
17. Paired based upon gender.	1.562	*
18. Pairing students with different interests.	2.451	
19. Unpopular paired with popular students.	2.055	
20. Extroverted paired with introverted students.	1.716	*
21. Based upon computer experience.	3.029	*

* Indicates p-value < 0.05

Table 3

High School Teachers Compared to Middle School Teachers

Questions 4-21 on test instrument	High School	Middle School	
4. Based on characteristics of their personality.	2.647	2.188	*
5. Allowing them to choose their partner.	2.647	1.875	
6. Based upon their race.	1.294	1.313	
7. Based on a beginning classroom assignment.	2.529	2.125	*
8. Based on socio-economic factors.	1.353	1.250	
9. Placing lower level with upper level students.	3.000	3.203	
10. Surveying them to determine what they like.	2.471	2.938	*
11. Should be paired randomly	2.824	2.938	
12. Paired based upon their intellectual ability.	2.529	2.375	
13. Paired based upon their physical ability.	1.824	1.938	
14. Less motivated with highly motivated students.	3.118	2.750	
15. Paired based upon standard test scores.	2.059	1.688	
16. Pairing gifted students together.	2.235	2.063	
17. Paired based upon gender.	1.588	1.563	
18. Pairing students with different interests.	2.588	2.313	
19. Unpopular paired with popular students.	2.235	1.875	
20. Extroverted paired with introverted students.	2.647	2.500	
21. Based upon computer experience.	3.059	3.000	

* Indicates p-value < 0.05

0-10 years teaching experience and a mean value of 2.188 from teachers with 11 or more years teaching experience (Table 4). Pairing students randomly received a mean value of 2.625 from teachers with 0-10 years teaching experience and a mean value of 3.188 from teachers with 11 or more years teaching experience (Table 4). Pairing students based upon their intellectual ability received a mean value of 2.938 from teachers with 0-10 years teaching experience and a mean value of 2 from teachers with 11 or more years teaching experience (Table 4). Pairing students based upon standard test scores received a mean value of 2.125 from teachers with 0-10 years teaching experience and a mean value of 1.647 from teachers with 11 or more years teaching experience (Table 4). Pairing gifted students together received a mean value of 2.438 from teachers with 0-10 years teaching experience and a mean value of 1.765 from teachers with 11 or more years teaching experience (Table 4). Pairing students based upon gender received a mean value of 1.813 from teachers with 0-10 years teaching experience and a mean value of 1.412 from teachers with 11 or more years teaching experience (Table 4). Pairing unpopular students with popular students received a mean value of 2.375 from teachers with 0-10 years experience and a mean value of 1.765 from teachers with 11 or more years teaching experience (Table 4). Pairing students with computer experience with students who do not have computer experience received a mean value of 3.25 from teachers with 0-10 years teaching experience and a mean value of 2.824 from teachers with 11 or more years teaching experience (Table 4).

Table 4

0-10 Years Experience Compared to 11 or More Years Experience

Questions 4-21 on test instrument	0-10 years	11 or more years	
4. Based on characteristics of their personality.	2.563	2.294	
5. Allowing them to choose their partner.	2.312	2.353	
6. Based upon their race.	1.438	1.250	
7. Based on a beginning classroom assignment.	2.625	2.118	*
8. Based on socio-economic factors.	1.438	1.250	
9. Placing lower level with upper level students.	3.125	3.000	
10. Surveying them to determine what they like.	2.813	2.588	
11. Should be paired randomly	2.625	3.118	*
12. Paired based upon their intellectual ability.	2.938	2.000	*
13. Paired based upon their physical ability.	1.875	1.824	
14. Less motivated with highly motivated students.	3.125	2.765	
15. Paired based upon standard test scores.	2.125	1.647	*
16. Pairing gifted students together.	2.438	1.765	*
17. Paired based upon gender.	1.813	1.412	*
18. Pairing students with different interests.	2.500	2.412	
19. Unpopular paired with popular students.	2.375	1.765	*
20. Extroverted paired with introverted students.	2.625	2.529	
21. Based upon computer experience.	3.250	2.824	*

* Indicates p-value < 0.05

Interpretations

Hypotheses

Hypothesis I stated that educators would rate various pairing methods used for delivering modular Technology Education a higher value than others. Table 2 shows the results of the two sample t-test between pairing techniques. The significant difference of pairing techniques 6, 8, 9, 10, 11, 13, 14, 15, 16, 17, 20, and 21 are all below the p-value of 0.05. From these results, H_{01} will fail to be rejected.

Hypothesis II stated that High School Technology Education teachers would give some pairing methods higher values for delivering modular Technology Education than Middle School Technology Education teachers. Table 3 shows the results of the two sample t-test between High School Technology Education teachers and Middle School Technology Education teachers. The significant difference of pairing techniques 4, 7, 10 are all below the p-value of 0.05. From these results, H_{02} will fail to be rejected.

Hypothesis III stated that teachers with 11 or more years teaching experience would give some pairing methods higher values for delivering modular Technology Education than teachers with 0-10 years teaching experience. Table 4 shows the results of the two sample t-test between teachers with 11 or more years teaching experience and teachers with 0-10 years teaching experience. The significant difference of pairing techniques 7, 11, 12, 15, 16, 17, 19, 21 are all below the p-value of 0.05. From these results, H_{02} will fail to be rejected.

Recommendations

Instrument

The test instrument does cover valid pairing methods used by Foundations of Technology and Diversified Technology teachers in the Knox County School System. Although the test instrument is quite reliable, some of the pairing methods should be removed.

Testing and Scoring

Some problems were discovered during the scoring of the test. Due to haste, confusion, fatigue, or some other unknown factor on the part of the test takers may have influenced the results. Some of the teachers exhibited a lack of sincerity while taking the test by using repetitive patterns to complete the test. Scoring was also difficult on some tests due to the fact that some teachers circled part of another answer which made it difficult to determine which answer they had chosen.

As a means to prevent either situation, it is recommended that the teacher be allowed to (a) mark with an X, (b) darken the corresponding answer. This would avoid the risk of partially circling another answer by mistake. The researcher could then be certain of the answers marked on the test instrument. After marking the answers, the researcher should review the answers to reveal questions marked with more than one answer.

Another alternative would be to have the test taken electronically. By allowing the participants to take the test electronically the problem of accidentally marking two answers would be removed. This would also allow the study to be expanded to more

than Knox County Teachers. The use of email would make sending and receiving the test much easier than using traditional means.

Laboratory

The space provided was not conducive to the needs of a classroom. Participants were spread throughout a classroom and were required to share desk space. It was difficult for the researcher to communicate with the participants due to the fact that they were spread out over the classroom. It is recommended that participants have there own space and that they should be seated in a uniform fashion in order for communication to be adequate.

Future of Modular Classrooms

As indicated in Chapter 1 the modular classroom is becoming popular among vocational classes. Many schools are improving or increasing the number of modular classrooms. With this in mind, it is advisable to repeat this study in the near future, at least within the next four to six years. By that time, teachers may have more insight into which pairing mechanisms prove to be more valuable than others.

REFERENCES

References

Alper, S., & Ryndak, D. (1992). Educating students with severe handicaps in regular classes. *The Elementary School Journal, 92,* 3-5.

Borg, R. Walter. (1966). *Ability grouping in the public schools* (2nd ed.). Madison, WI: Dembar Educational Research Services.

Borko & Niles. (1982). Factors contributing to teachers' judgments about students and decisions about grouping students for reading instruction. *Journal of reading Behavior, 14,* 127-140.

Bouri, Janet and Lunn. (1969). *Too small to stream: A study of grouping in small junior Schools.* England: National Foundation for Educational Research in England and Wales.

Carnes, Lindbeck, & Griffin. (1987). *Effects of group size and advance organizers on learning parameters when using microcomputer tutorials in kinematics.* Springfield, IL: John Wiley & Sons, Inc.

D'Apolito, Thomas. (1999). *Technology Education Standards.* Nashville, TN: Tennessee Board of Education.

Elliott, John. (1976). *Teachers learn about inquiry/discovery approaches.* San Francisco, CA: American Educational Research Association.

Evans, John. (1985). *Teaching in transition: The challenge of mixed ability grouping.* Philadelphia, PA: Open University Press.

Galton, Maurice, and Williamson, John. (1992). *Group work in the primary classroom.* New York: Routledge, Chapman and Hall, Inc.

Hunt, Jenny, and Jackson, Heather. (1992). *Vocational education and the adult unwaged.* London: Kogan Page Limited.

Manning, M. Lee, and Lucking, Robert. (1983). Ability grouping: Realities and alternatives. *Reviews of Research, 66,* 254-258.

Mehan, H., & Hertweck, A., & Meihls, J. (1986). *Handicapping the handicapped.* Stanford, CA: Stanford University Press.

Olmstead, Joseph. (1974). *Small-group instruction: Theory and practice.* Alexandria VA: Human Resources Research Organization.

Ozmon, A. Howard, & Craver, M. Samuel. (1995). *Philosophical foundations of education,* (5th ed.) Columbus, OH: Merrill Publishing Company.

Palmer, Richard. (1971). *Space, time, and grouping.* New York: Citation Press.

Raizen, A. Senta, & Sellwood, Peter, & Todd, D. Ronald, & Vickers, Margaret. (1995). *Technology education in the classroom.* San Francisco: Jossey-Bass Publishers.

Rickover, H.G. (1983). The will and the way (some thoughts on improving American education). *American-Education Journal, 19,* 39-46.

Ryan, H. Hinds. (1927). *Ability grouping in the junior high school.* New York: Harcourt, Brace, and Company.

Schmuck, R. & Schmuck, P. (1975). *Group processes in the classroom.* Dubuque IA: William Brown Co.

Skinner, B.F. (1976). *Beyond freedom and dignity.* New York: Walden Two.

Slavin, E. Robert. (1987). *Cooperative learning: Student teams.* Washington D.C: National Education Association.

Strang, Ruth. (1958). *Group work in education.* New York: Harper and Brothers, Pub.

Svensson, Lennart. (1976). *Study skill and learning.* Germany: University of Gothoburgensis.

Thelen, A. Herbert. (1967). *Classroom grouping for teachability.* New York: Wiley.

Toseland, W. Ronald, and Rivas, F. Robert. (2001). *Group work practice.* Needham Heights, MA: Allyn & Bacon.

Wagner, W., & Smith, H., & Kopf, M. (1996). *Modern carpentry.* Tinley Park, IL: Goodheart-Wilcox Co.

Webster's dictionary and thesaurus (Deluxe ed.). (2001). U.S.A.: Allied Publishing Group, Inc.

Wright, T. (1997). Modules: Friend or foe. *The Technology Teacher, 57,* 12-15.

APPENDIXES

Appendix A

Certification of Exemption from Review by IRB Review

For Research Involving Human Subjects

THE UNIVERSITY OF TENNESSEE
KNOXVILLE

Department of Human Resource Development
310 Jessie Harris Building
Knoxville, TN 37996-1900
Telephone: (865) 974-2574
Fax: (865) 974-2048
http://hrd.bc.utk.edu
hrd@utk.edu

MEMORANDUM

TO: Joseph C. Ramsey
Randal H. Pierce
Vickie J. Stout
Mike Winstead

FROM: Ernest W. Brewer, Professor, Director/PI of the Federal Programs, and Chair of the Human Subjects Review Committee

DATE: March 5, 2001

RE: Form A – Certification for Exemption from IRB Review for Research Involving Human Subjects

---

Your request pursuant to your recent Form A (Certification for Exemption from IRB Review for Research Involving Human Subjects) has been approved by UTK's Office of Research for a period of up to one year. Please note that if the research project has not been completed within the one-year period you must resubmit a new Human Subjects Form in order to continue the project.

As the HRD Department's Human Subjects Review Chair, please feel free to contact me if you have any questions.

xc: Ms. Brenda Lawson, UTK's Office of Research
Dr. Billie Collier, Associate Dean and Interim Dept. Head
Dr. Lane Morris, Associate Professor

IRB # _____
Date received in ORA _____

FORM A

Certification of Exemption from Review by IRB Review
For Research Involving Human Subjects

A. PRINCIPAL INVESTIGATOR(s) and/or CO-PI(s)

Joseph C. Ramsey
Randal H. Pierce
Vickie J. Stout
Mike Winstead

B. DEPARTMENT/UNIT

College of Human Ecology, Department Human Resource Development

C. COMPLETE MAILING ADDRESS AND PHONE NUMBER OF PI(s) and CO-PI(s)

Joseph C. Ramsey
Diversified Technology Teacher, Knox County Schools
West High School
3300 Sutherland Avenue
Knoxville, Tennessee 37919
594-4477
joeram72@yahoo.com

Randal H. Pierce
Department of Human Resource Development
410 Jessie Harris Building
974-6132
rpierce@utk.edu

Vickie J. Stout
Department of Human Resource Development
306 Jessie Harris Building
974-6289
vstout@utk.edu

Mike Winstead
Department of ITCE
A533 Claxton
974-5037
mwinstead@icx.net

D. TITLE OF PROJECT

A comparison of methods used in pairing students in a modular classroom setting.

E. EXTERNAL FUNDING AGENCY AND ID NUMBER (if applicable)

Not applicable

F. GRANT SUBMISSION DEADLINE (if applicable)

Not applicable

G. STARTING DATE: Upon certification by Coordinator of Compliances

February 19, 2001

H. ESTIMATED COMPLETION DATE

April 27, 2001

I. Objective(s) of Project

On February 19, 2001, a test survey will be sent to all Knox County Diversified Technology and Introduction to Technology Teachers.

The ***purpose*** of the proposed research is to determine appropriate pairing techniques used throughout Knox County.

II. Subjects

All middle and high school Diversified Technology and Introduction to Technology teachers are invited to participate in the survey. The teachers comprise the target audience intended for the purpose of this survey. All teachers are licensed by the state of Tennessee to teach Diversified Technology and Introduction to Technology.

III. Methods or Procedures

Use of the test instrument survey

Using the test instrument form, participants will complete the form that will be available to them on February 19, 2001.

Participants will voluntarily supply their professional opinion. All information collected will remain confidential.

Only certified Knox County school teachers who are certified to teach Diversified Technology and Introduction to Technology will be allowed to participate in the study.

The researchers have taken precautions to design, develop, and implement A test instrument in which the participants may remain anonymous.

The survey will be mailed to each Diversified Technology and Introduction to Technology teacher immediately upon certification by Coordinator of compliances.

Participation of this survey is voluntary. Survey completion requires that the participant *knowingly and purposefully*

(a) chooses or designates responses he/she perceives to best represent his/her experience in a modular classroom setting, and
(b) returns the survey responses, the participant consents in an informed manner to evaluation of his/her survey.

IV. CATEGORY(s) FOR EXEMPT RESEARCH PER 45 CFR 46

Paragraph 2 - research involving survey procedures--entitles this research Effort to exemption, per 45 CFR 46.101(b) from review by the Institutional Review Board. The probability and magnitude of harm or discomfort anticipated in the research are not greater in and of themselves than those ordinarily encountered in daily life or during the performance of routine physical or psychological examination or tests.

CERTIFICATION

The research described herein is in compliance with 45 CFR 46.101(b) and presents subjects with no more than minimal risk as defined by applicable regulations.

Principal Investigator ___Joseph Ramsey___ Name — Signature — 2/13/01 Date

Co-Investigator ___Randal Pierce___ Name — Signature — 2/14/01 Date

Co-Investigator ___Vickie Stout___ Name — Signature — 2-15-01 Date

Co-Investigator ___Mike Winstead___ Name — Signature — 2/13/01 Date

~~Dept Review~~
~~Comm. Chair~~ (Randal Pierce) Name — Signature — 2/14/01 Date

Duplicate not needed

Dept. Head ___Billie Collier___ Name — Signature — 3/7/01 Date

APPROVED: Coordinator of Compliances, Office of Research Administration — Signature — Date

Dept. Review
Comm. Chair Ernest W. Brewer Signature — 3-5-01 Date

Appendix B

Test Instrument

Please answer the following questions to the best of your ability

1. How many years of teaching experience do you have? 0-5, 6-10, 11-15, 16 or more
2. Do you teach in a high school or middle school? High School, Middle School
3. Do you teach in a modular setting? Yes, No

Please rank the following pairing strategies according to their value for delivering modular technology education.

N= No Value L= Low Value M= Moderate Value H= High Value

4. Students should be paired together based upon the characteristics of their personality.	N	L	M	H
5. Students should be paired together by allowing them to choose their partner.	N	L	M	H
6. Students should be paired together based upon their race.	N	L	M	H
7. Students should be paired based upon a beginning classroom assignment.	N	L	M	H
8. Students should be paired together based upon their socio-economic factors.	N	L	M	H
9. Students should be paired together by placing lower level students with upper level students.	N	L	M	H
10. Students should be paired together by surveying them to determine what they like.	N	L	M	H
11. Students should be paired randomly.	N	L	M	H
12. Students should be paired together based upon their intellectual ability.	N	L	M	H
13. Students should be paired together based upon their physical ability.	N	L	M	H

14. Students should be paired together by placing less motivated students with highly motivated students.	N	L	M	H
15. Students should be paired together based upon standard test scores.	N	L	M	H
16. Students that are gifted students should be paired with other gifted students.	N	L	M	H
17. Students should be paired together based upon gender.	N	L	M	H
18. Students should be paired with students who have different interests.	N	L	M	H
19. Unpopular students should be paired with popular Students.	N	L	M	H
20. Extroverted students should be paired with introverted students.	N	L	M	H
21. Students who have computer experience should be paired with students who do not.	N	L	M	H

VITA

Joseph C. Ramsey, was born in Knoxville, Tennessee on June 17, 1972. He attended schools in the public school systems of Knox County in the city of Knoxville. In 1990, he graduated from Carter High School. Immediately following high school he attended the University of Tennessee, Knoxville. After completing one year at the University of Tennessee he enrolled at Walters State Community College. After completing two years at Walters State Community College he transferred back to the University of Tennessee. He entered the College of Human Ecology, Human Resource Department's Technology Education program. In May of 1997, he received his Bachelor of Science Degree in Education, major field of study was Human Resource Development, Technology Education. Immediately following graduation he enrolled in the College of Human Ecology graduate program of Human Resource Development. Before completing the graduate program he applied for a teaching position in the Knox County School System and received his first teaching position at North West Middle School. He returned to the University of Tennessee and reapplied into the graduate program. In December of 2001, he received his Master of Science degree in Human Resource Development, Technology Education.