Identifying and Reaching the Hands-on Learner

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Abstract:

The following research is the result of frustrations involving teaching carpentry students who display little interest in learning within a classroom environment; however, often the same students excel in a laboratory (kinesthetic/hands-on) situation.

Learning style surveys were given and nearly ninety percent of the students within this program were identified as showing a preference for kinesthetic learning (as opposed to visual or auditory). A survey known as the Self Administered Inventory of Learning Strengths (SAILS), was initially given to the students and then compared to a questionnaire which asked students to identify their own perceived learning style. Statistics between the questionnaire and the SAILS survey did not match up. A second learning style survey was then administered (a modification of the original SAILS). This time the results were nearly identical to the students perceived learning styles.

Grade data of a carpentry lecture course and a carpentry laboratory course, which paralleled each-other's subject matter, were collected and analyzed in order to reinforce the learning style survey. The grade data also supported the following preliminary hypothesis:

1. Students who perform well in lecture are likely to perform well in the laboratory. 2. Students who perform poorly in laboratory are likely to also perform poorly in lecture. 3. Students who perform poorly in lecture show no correlation to performance in the laboratory course. 4. Students who perform well in the laboratory show no correlation to performance in the lecture setting. Students were statistically also shown to prefer laboratory classes to lecture classes, and to get higher grades in laboratory classes.

Some recommendations based on other research are suggested, on how to reach the kinesthetic learners in a lecture setting, and how these learners can help themselves.

Chapter 1

Reaching the Hands-on Learner in a Lecture Setting

Introduction

Following is a description of a study to be completed during the course of two semesters (fall 05 – spring 06) through SUNY Oswego's, VTP Masters degree program. The study will be performed entirely at SUNY Delhi, using the freshman students in the Carpentry program. Related supplemental research studies will also be utilized.

This chapter of the study will begin with a statement of the problem, followed by, the purpose of the study. The study population will be identified and questions that the study is seeking to answer will posted as well as hypotheses that are being tested. Background information will also be given and utilized. Projections will be made as to how this study may affect existing knowledge. The significance of the study will be discussed, and how the results may affect educators, and potentially improve the school. A number of assumptions will be taken

in order to simplify some of the variables. Limitations of the study will be mentioned and operational terms defined.

Statement of the problem

Students often display a preferred learning style (auditory, visual, or kinesthetic/tactile). In informal polls, the majority of students in technical education and trade programs often indicate a preference for hands-on learning methods (kinesthetic/tactile). These students are often unwilling, or view themselves as unable, to excel in a classroom environment. According to research performed by Anne Villems (2000) kinesthetic learners are in the minority, comprising of only five percent of the total population. Contradictory information, found in an unpublished paper, (Basualdo, n.d.) states that this figure may be as high as thirty to forty percent. An educational learning styles website run by Owensboro Community Technical College found at http://www.octc.kctcs.edu/tlc/Learning%20Styles/tlclearningstyles.htm agrees that approximately 30% of the students will display a kinesthetic learning preference.

Even though researchers (Villems, 2000), (Basualdo, n.d.) may not agree as to the exact percentages of the different types of learners, the

trade programs likely attract a larger percentage of kinesthetic learners than other educational disciplines.

Research performed by Rita Dunn states that "The greater the match between the student's and his or her teacher's style, the higher the grade point average, the lower the match, the lower the grade point average." (Dunn, 1983, p. 60).

Many trade programs require a combination of lecture and laboratory components. This presents a challenge for the instructor on how to best to teach and reach the hands-on learner during a lecture setting.

When a course has both a laboratory, and lecture component, the hands-on skills are expected to be taught in the laboratory portion of the course, the lecture being reserved for supplementary and complimentary information/work. At SUNY Delhi, when teaching lecture courses with related laboratory work requirements, or even a dedicated laboratory course, the lecture is used to provide students with information, some of which s/he can apply when in the laboratory, so as to make more efficient use of time. The current academic policy through SUNY Delhi does not define how, or what, to teach in a lecture vs. laboratory setting. However, in personal communication with various professors, and the Provost, Dr. Dennis Callas (September, 29 2005), the general consensus

is that the lecture portion is reserved for instructing students and utilizing various multi-media supplemental devices to aid the professor. The use of tools, skill development, and work on projects are frowned upon during time reserved for lecture. On the other hand, laboratory time is reserved for hands-on work, such as building a house, cabinetmaking projects, practicing layout of various types, hand skill and tool skill development.

Further communications with the State Education Department personnel by Dr. Callas from Delhi, yield no existing policy at the State University level, regarding the type of activities allowed to be conducted during lecture or laboratory instructional time (Dr. Dennis Callas, September 29, 2005, personal communications).

Purpose of the study

The purpose of this research study is threefold; first, to identify the percentage of kinesthetic learners attending the Delhi Technology College's carpentry program; second, to determine if students, in general, obtain higher grades in laboratory classes than in lecture, and determine what grade correlations exist; and third, through existing research, identify different ways for assisting the kinesthetic (hands-on) learner in

improving his or her performance/learning while participating in a lecture setting.

Study population

This study will encompass the college level freshman class of Carpentry students at State University of New York (SUNY) at Delhi. The study will be limited to those students who entered the college during the fall semester of 2005.

The above mentioned problem is likely, not unique to Carpentry students but common to many technical and trade programs such as Electrical, Automotive, HVAC, Welding, and many others requiring hand skills. It is apparent that these technical and trade programs tend to attract students who prefer working with their hands, thus it seems logical that they will prefer learning activities of a manual or active nature. Furthermore, it also appears that the learning preference of these students could be a highly overlooked nationwide phenomena that may affect many schools, organizations, colleges and universities nationwide, not just SUNY Delhi.

Questions to be answered

This study will ascertain to answer several questions relating to the learning of manual, or kinesthetic, learners. Specifically the study will answer the following questions:

1. Is there a strong correlation between good grades in the classroom and the laboratory?
2. Is there a correlation between poor grades in the laboratory and poor grades in the classroom?
3. What teaching techniques can be used in lecture settings that are known to help kinesthetic learners?
4. What can the students do to help themselves?
5. Is there anything that can or should be done with these students at the beginning of their courses, in order to enhance their future learning experiences?

Hypotheses to be tested

The following hypotheses will be tested as part of this research study:

1. There are more that 30% of kinesthetic learners in the Carpentry program at SUNY Delhi.

2. SUNY Delhi Carpentry Program students obtain higher grades in laboratory based courses than in lecture based courses.
3. SUNY Delhi Carpentry students who perform well in lecture also perform well in the laboratory courses.
4. SUNY Delhi Carpentry students who perform poorly in laboratory also perform poorly in lecture.
5. SUNY Delhi Carpentry students who perform poorly in lecture settings show no correlation to their laboratory performance.
6. SUNY Delhi Carpentry students who perform well in a laboratory setting show no correlation to their lecture performance.
7. There are a higher percentage of students that prefer laboratory classes over lectures.

Background of the study

SUNY Delhi is known as a SUNY Technology College. According to the State University of New York website (SUNY, 2005a), there are eight Technology Colleges within the SUNY system. These colleges teach a variety of programs, not all are trade related (SUNY, 2005b). At SUNY Delhi, over 500 students (approximately 25%) are enrolled in the Technology Division which comprises of the following programs:

Architecture, Automotive, CADD, Carpentry (which includes: Cabinetmaking, Masonry, and Remodeling), Construction Technology, Electrical, HVAC, Plumbing and Heating, Refrigeration, and Welding. Some programs have several variations within the major study area (Addison, October, 2005). It is apparent that some of these programs are much more "hands-on" than others. The technology program is dominated by males which comprise of more than 90% of the students (Addison, October 2005).

There have apparently been many studies performed on teaching toward the recognized types of preferred learning styles. Likewise, there has been much written on the subject of motivation of students (McKeachie, W., J., 1995), (Campbell, L., Campbell, B., Dickinson, D., (1998), (Deci, E., Vallerand, R., Pelletier, L., and Ryan, R, 1991), (Dunn, 1983). However, these are generally lacking the specificity of this study, in that the other studies often focus on suggestions that try to involve the student in activities where they use their hands. This isn't always possible or practical in the college lecture environment. By addressing the dilemma of teaching to these students, without using the hands-on methods that they are allowed to use in lab, some valuable information may be uncovered that will benefit teachers, which in turn will ultimately assist the students.

High school CTE programs, SUNY Technical Colleges, Job Corps programs, trade schools, and other organizations may also benefit from the results of such a study. Too often a failed written test is simply blamed on the student because "s/he didn't study enough." An attempt will be made to create awareness that there may be existing paths to better help students (in the classroom) who prefer to work with their hands.

This is an overlooked area of study most likely because it is in a somewhat unique setting (CTE programs, SUNY Technology Colleges, Trade schools), a minority of the education population. However as unique of a setting as it is there are large numbers of students enrolled in similar programs across the nation. If these students can be taught in a manner where they can more easily and effectively digest the information, this could have many other positive repercussions such as, increased retention, (which will increase the graduation rate), producing a more effective worker (more knowledgeable), higher grade-point-average standings, entrance to better colleges, enhanced scholarship opportunities, this list could continue on with related items.

By identifying some things we may be doing wrong, or right, then taking the time to make adjustments, progress can be made in directing students more effectively towards procedures that aid this type of learner

in a classroom setting, thus improving their overall performance and educational experience (Dunn, 1983).

Educators that teach in a similar environment, as previously described, may find this information valuable and effective. Future researchers may be able to build from this study in other directions to create an even more effective learning environment. Educators may have to be willing to change some ingrained methods they have used for many years in order to try some, "new", or at least different, teaching techniques, and in doing so, release former prejudices.

This information will be useful not only to SUNY Delhi's Carpentry program and other trade programs within the college, but also for many other educational areas where students experience similar lecture/lab requirements. Included would be school districts that house high school BOCES programs, non-BOCES secondary education technology programs, technology oriented college programs, professional trade schools, union training programs (such as a carpentry or electrical union), Job Corps institutions, and other organizations involved in this type of instruction.

If recommendations of this study are followed; Students may eventually receive higher grades due to greater understanding (Dunn 1983). This may also have an effect on retention and student success.

Happier employers because of better prepared workers, (this could spin off to better employer relationships with schools), could increase educational donations, job placement, community relations, there are many possible positive ramifications.

As in most studies, in order to simplify some of the variables, a number of assumptions must be made. These assumptions will speed the research process and in turn make it manageable in terms of scope. Following are a number of assumptions made in this study.

- All testing/surveys will be performed on students enrolled in the SUNY Delhi Carpentry program.
- Age, gender, race, religion, financial background, previous schooling history, disabilities or previous knowledge from working will not be considered. Teachers generally have little control over the backgrounds of the students they teach, thus, these variables will be discarded.
- All students answer surveys/questions/interviews in a truthful manner
- Students are enrolled in this type of a program by their own choice.
- Grades (used in information gathering) and assessments given by teachers were done so in a fair and unbiased manner.

- There are many theories on learning types KOLB, VARK, and more (Bogod, 2002) some studies do not specifically mention the kinesthetic/tactile learner (Fisher, Fisher, 1979); however, the kinesthetic learning style will be the focus of this study.
- Based on previously mentioned research, kinesthetic learners make up 5% - 40% of the population.

This study has a couple of limitations, the first being that it is meant to be useful for those teaching and learning in environments as previously described. Secondly, there is no reason why this study cannot be applied to any program which utilizes a laboratory/lecture setting, and appears to have a large percentage of kinesthetic learners.

Definition of terms

This study will utilize some common language words that need to be further defined with an "operational definition", or defined in the way the term is meant in this study.

Preferred learning style – it is the tendency to learn best when information is presented in a specific format, such as, auditory learners prefer hearing information; kinesthetic/tactile learners prefer to participate in activities in order to learn.

Lecture – It is an educational setting where the teacher instructs students by speaking to them, using a black/white board, as well as using various multimedia presentation techniques (overhead projectors, slide shows, power point, movie clips etc.)

Laboratory – It is an educational setting where the teacher instructs the students: to learn skills, to use tools, construct projects, in general spend the time using their hands.

Chapter 2

Review of Related Literature

Reaching the Hands-on Learner in a Lecture Setting

Several related studies have been identified and reviewed thus far; "related" being the key word. While there have apparently been large amounts of research performed on the various learning styles (Glass, 2003), (McKeachie, 1995), (Siegel & Lester, 1994), (Fisher, Fisher, 1979), no studies have of yet been identified that have the same characteristics, or problem, of this study.

One promising resource (Glass, 2003) does address learning styles/preferences at the secondary/post secondary levels as well as the concerns for teaching these students in a theoretical (lecture) setting. The report offers some insight and valuable background information. However, this particular study is geared toward supporting the idea that kinesthetic learning/teaching, although more expensive, is needed in the post-secondary environment.

Another interesting study (McKeachie, 1995) places some blame on the students for not venturing outside of their preferred learning styles, and offers suggestions to help teach students to learn in different ways. However, McKeachie also states, “None of the learning styles makes nearly as much difference as the student’s prior knowledge, intelligence, and motivation.” (McKeachie, 1995, p3.)

Surveys have been located that will help to identify preferred learning styles of the students (Plecas, 2002), (Siegel, 1994). These two surveys are designed to be administered in a classroom setting then graded by hand. This type will most likely be used for this study. Siegel (1994) also offers a rationale for teaching students about their preferred learning styles.

Other research indicates that students are accurately able to self-assess their learning preferences, and when paired with complimentary teaching, their grades will improve (Dunn, 1983). This and research performed by Basualdo (n.d.) may be useful for background information and for the purpose of constructing a questionnaire for the students to answer.

An educational website found shows several “Learning Style Assessment Instruments” (Bogod, 2005) as its title indicates. Some of the surveys listed and others found elsewhere are meant to be taken

online then submitted for analysis (Felder & Soloman, n.d.); this type is less convenient and will not be considered for this project. This website also evaluates some of the existing learning style surveys available today.

An educational website associated with Macalester College posted an article by Karl Wirth titled “Learning to Learn”. The article gives insight to both students and teachers on the learning and teaching processes (Wirth, n.d.). This article may provide some insightful information for this study.

Books such as Educational Psychology (Slavin, 2003) and Teaching and Learning Through Multiple Intelligences (Campbell, Campbell, & Dickinson, 1998) will also aid in providing useful background information regarding learning theory and teaching techniques.

Chapter 3

Methodology

Reaching the Hands-on Learner in a Lecture Setting

This chapter of the study will began with a description of the research design, followed by the student sample, the sampling technique and its justification. Variable control, data collection processes, data analysis techniques, and the organization of such data will also be addressed. Finally a timeline of the procedures of this study will be shown.

Research Design

This study has three parts. The first part is aimed at determining what percentage of kinesthetic learners there are in SUNY Delhi's 2005 freshman carpentry program. The second part will attempt to identify

any correlations between laboratory grades and lecture grades. Third, the study will offer insight into how to effectively teach these students in a lecture setting and give information as to how students can help themselves.

The first part of this correlational research study will involve data collection from a survey and questionnaire that the students will take, then comparison of some of the data. The survey information gathered will help to determine favored learning styles of the students, specifically, the percentage of kinesthetic learners in the study group. The questionnaire data will be compiled to compare whether students' perceptions of their preferred learning styles, match those of the learning style survey results. These results will be compared as a percentage of the study population.

The research design for the second portion of the study will again follow the correlational type of research. The book *Introduction to Research in Education* (Ary, Jacobs, Razavieh, Sorensen, 2006, p. 376) describes correlational research as:

> "A type of nonexperimental research that investigates whether there is an association between two or more variables. Specifically it investigates how scores on

> one or more variables rise and fall as scores on other variables rise or fall. We want to know if high scores on one variable are associated with high scores on another variable, or whether high scores on one are associated with low scores on the other."

For this portion, class and laboratory grade data will be collected then plotted on scatter plots. These scatter plots will be shown in order to identify correlations between "poor" grades (example C+ or worse) and "good" grades (example B- or better). For example, students who receive good grades in lecture (independent variable) will be compared to their lab performance (dependent variable); also students who perform poorly in lecture will be compared to their laboratory performance. Conversely, reverse relationships comparisons will also be made by utilizing the laboratory grades as the independent variable and the lecture grades as the dependent variable.

Speculation as to the results of this data has previously been made in chapter one of this research.

The third and final part of this design will involve compiling recommendations from previous researchers on methods of reaching the kinesthetic learners in a lecture setting.

Sample

The sample used for this study will be the entire 2005 freshman class of Carpentry students from SUNY Delhi. At the beginning of the semester, seventy two students were enrolled in the program. However, by the end of the first semester, several had either dropped the course, dropped out of college, or were dismissed (personal knowledge). Questionnaire data will confirm that most students' ages are between 17 and 20. Only three of the students are female. Background information such as race, religion, socio-economic status and more will not considered a part of this study. Thus questions pertaining to these issues will not be a part of the questionnaire.

Sampling Technique

To eliminate bias, and attempt to be as fair as possible, the sample will encompass the entire 2005 freshman class that is enrolled in the carpentry program at SUNY Delhi. The author has ready access to these students and their grades, and if need arises, grades from past classes for comparison.

Variable Control

The variables will be determined depending on what data is being compared and in what order. For example, when comparing student performance in lecture vs. laboratory, grades will be broken into the following categories: Students who performed well (B- or better) in lecture (independent variable) will be compared to their laboratory performance (dependent variable). Next students who perform poorly (C+ or worse) in lecture (independent variable) will be compared to their laboratory performance (dependent variable). Furthermore, the following reverse correlations will be executed: Students who perform well in laboratory (independent variable) will be compared to their lecture (dependent variable) performance. Finally students who perform poorly in the laboratory (independent variable) will be compared to their lecture (dependent variable) performance.

A variable that could be manipulated is the grade cutoff between "poor" grades and "good" grades. This may change slightly from the planned B- , C+ as described above when a general scatter plot of all of the grades is compiled and reviewed to see if there is an obvious separation of grade levels.

Data Collection Strategy

All common questionnaire or survey data collected will be gathered in one sitting, all students will be together at one time for each questionnaire or survey. No data will be discarded, so as to eliminate bias. Furthermore, the questionnaire and survey will be verbally read to the students so that any misinterpretation of the questions is held to a minimum. Several of the students are learning disabled and of these, some may even be allowed readers when taking tests (personal knowledge due to signing of student disability paperwork).

Grades collected will also encompass the entire freshman class of carpentry students; no grade data will be discarded. Note: several students will have dropped out of college between the time of the grade data collection (end of the first semester) and the time the questionnaire and survey are administered (second semester), therefore the number of students taking the survey will not be the same as the number of students indicated by the grade data information.

Data Collection Instrument

The data collection instruments will be a questionnaire, a survey to determine preferred learning styles, student's grades, and previous research studies such as: Villems, (2000), Basualdo, (n.d.),

McKeachie, W., J., (1995), Campbell, L., Campbell, B., Dickinson, D., (1998), Deci, E., Vallerand, R., Pelletier, L., and Ryan, R, (1991).

The initial Learning Styles Survey will be written by another author such as Plecas, (2002) or Siegel, (1994,)who is familiar with this type of testing, his/her administering instructions will be followed.

As part of the questionnaire that this author will compile and administer, the students will also be asked to identify their own preferred learning style after being given descriptions of the characteristics of each style. Research has shown that students can correctly identify their preferred learning style (Dunn, 1983).

Grade information will be supplied by this author who has access to the grades and records necessary for this study.

Data Analysis Technique(s)

The learning style survey will be administered and graded as per the test author's instructions and intent.

The questionnaire, compiled by the author of this project, will be used to compare students' own assessments of their perceived learning style and for general background information deemed necessary for this study.

Grade analysis will be straight comparisons between the class grade averages for lecture vs. the class average for Laboratory.

Grades will also be used, in context of scatter plots, to determine if there is a correlation between good grades in lecture vs. good grades in laboratory, poor grades in lecture vs. poor grades in laboratory, and a correlation to see if there is any relationship to poor grades in laboratory vs. poor grades in lecture, and good grades in laboratory vs. good grades in lecture. Even though the comparisons may sound similar they are not. For example, a student who performs well in lecture may also perform well in the laboratory. However, a student who performs well in the laboratory may not perform well in lecture.

Grades and other data will not be altered; they will simply be compared through the use of graphs and charts to help show general trends, averages, and correlations.

Data Reporting Format and Organization

Learning style surveys will be compiled to show the percentages and numbers of the students that display each of the three different learning styles this study is considering (auditory, visual, kinesthetic).

Questionnaires will be compiled and student comments may be used as evidence in this study.

Class grades collected will be compared by each individual student who is taking both, the lecture, and laboratory portion, of the course (almost all students). Privacy of each student will be kept by only comparing the grades side by side and without ever revealing students identities.

Scatter plots will be generated and utilized in order to consolidate grade data into a readily viewable format.

Research information collected from other sources will be organized in an orderly format so as to offer helpful suggestions to the teachers and students who are affected by this study.

Timeline to Be Followed in Completing the Study

Following are a list of tasks to be completed during this study, also included are the corresponding dates.

- Start gathering information from previous research (9-05)
- Preliminary Proposal for Chapter 1, (10-24-05)
- Preliminary Proposal for Chapter 2, (11-14-05)
- Preliminary Proposal for Chapter 3, (11-28-05)
- Proposal for Chapters 1,2,&3, (12-12-05)

- Gather grade information (12-16-2005)
- Compile grade information (1-31-06)
- Administer learning styles survey (1-31-06)
- Administer questionnaire (1-31-06)
- Compile results of learning style survey (2-14-06)
- Compile results of questionnaire (2-14-06)
- Complete gathering of all research information 3-1-06)
- Write rough draft (4-1-06)
- Write final draft and conclusions (5-10-06)

Chapter 4

Part I

Survey Data Collection and Comparison

Note: The surveys were administered to the second semester students of the Carpentry program during the spring of 2006. By this time several students had dropped out of school since the grade comparison data had been collected (December, 2005). In part one of this chapter the original survey and questionnaire will be analyzed. In part two of this chapter another (second) survey was administered and analyzed. In part three of this chapter, grade data will be analyzed

Following is the first survey given to the students to help determine favored learning styles. All questions were read allowed to the students so that any misunderstandings could be addressed as each question was read; this also ensured all students would complete the survey in a

timely manner. Reading aloud also helped those students who may have had reading difficulties. The purpose of the lettered questions (the first set of questions), are to identify students' perceptions of their own learning styles, and for general background information. Students were advised that the purpose of the test was to determine what percentage of students fit into each of the three learning styles. They were encouraged to answer honestly and accurately.

Prior to starting the test, students were read the following descriptions of learning styles and asked to consider which applied to them. These descriptions were found at the Learner Support Center on the University of Ontario Institute of Technology website http://www.dc-uoit.ca/EN/main/learnersupportcentre/84673/learning_styles_inventory_workshop.html#LearningStyle

Visual: Some people are visual learners. That is, they learn best by seeing. If these people are told how to do something it just does not sink in. If they actually see it being done, they might think "Aha. I get it!" Some people read about something and they can easily recall what they have read. They see the written words and

understand. They take notes, draw diagrams, or create reference cue cards.

Auditory: Others learn best by hearing. These people can listen to a lecture, process the information and remember the content well enough to successfully write notes or tests afterwards. They can easily recall what they have heard and can reinforce the learning by saying what they have heard, by listening to tapes of lectures, or by creating tapes of lectures in their own words and listen to them while in a car or relaxing.

Tactile/Kinesthetic: Some people learn best in labs, in workshops, by typing, and by doing something creative. They are "hands-on" learners. They learn by doing.

After reading the above learning style descriptions the following survey was given/read to the students.

A. How old are you?

B. Do you prefer to attend lectures or labs?

C. Do you typically get better grades in laboratory classes or lecture classes

D. What is an average grade for you in a lecture class?

E. What is an average grade for you in a laboratory class?

F. Circle the picture/description below that best describes your preferred learning style.

These learning style descriptions and graphics are direct quotations from http://www.psy.pdx.edu/PsyTutor/StudyTips/LearnStyle.htm

The Three Main Learning Styles

Visual

Visual learners learn best by seeing the information and through visualization

Auditory

Auditory learners learn best by hearing the information and through repetition

Kinesthetic

Kinesthetic learners learn best by "doing" and through active participation

(Sage, 1999)

Immediately after the above questionnaire was completed, the Self Administered Inventory of Learning Strategies (SAILS) survey, as shown below was given/read to the students. (Siegel & Lester, 1994)

SAILS – Self Administered Inventory of Learning Strengths (Siegel & Lester, 1994)

Directions: Please read each statement and the two responses. Circle the letter that best describes your learning preferences.

1. When someone gives you road side directions….

A. You would rather write the directions out

C. You would rather draw a map

2. Which distracts you more when you are studying…

A. Loud noises

C. Flashing lights

3. Which do you notice first about people you are meeting for the first time…

A. The sound of their voices

C. Their facial features

4. When you are interested in a new book, would you rather…

A Listen to the book recorded on audio cassette

C. Read the book silently

5. When learning a new skill would you rather…

A. Listen to a professor describe the steps

C. Watch a class demonstration illustrating the steps

6. Which do you prefer…

B. Participating in an athletic activity

C. Watching others play the sport

7. If you lost your keys, would you more likely…

B. Retrace your steps

C. Visualize where you left them

8. Would you learn a lab experiment better if you…

B. Figured out the directions yourself

C. Watch the teacher demonstrate the experiment

9. Would you learn social studies better if you…

B. Role play as historical characters

C. Were shown slides and films of historical events

10. Which way is easier for you to learn how to cook…

B. Trying it out or experimenting

C. Following directions and illustrations

11. Which would you rather do…

A. Listen to a presentation

B. Give a presentation

12. Which would be easier for you to learn…

A. Words to a new song

B. Steps to a dance

13. Which is the easier way for you to learn a new language…

A. By hearing new words explained by a teacher

B. By encountering real life situations

14. Which situation would enable you to study better…

A. A room in absolute silence

B. A place where you have room to move around

15. Would you learn more in a class that…

A. Has you listening to interesting speakers

B. Has you participating in activities

The SAILS test forces students to answer either/or for the questions. There are five Audio/Visual (AV) questions, five Audio/Kinesthetic (AK) questions, and five Visual/Kinesthetic (VK) questions, giving a possible high score of 10 in each of the three classes (Siegel & Lester, 1994). The students were not made aware of the meaning of each of the letter answers.

In the survey:

"A" answers represent Audio (A) learning style.

"B" answers indicate Kinesthetic (K) learning style.

"C" answers are for Visual (V) learning style

.

Following are the compiled results of the SAILS survey.

Dominant Style	Number of Students/Percentage
V	27 (49.09%)
A	9 (16.36%)
K	11 (20%)
KV	3 (5.45%)
AV	2 (3.64%)
AK	1 (1.82%)
AVK	2 (3.64%)

Some concerns the author had about the questions follow:

Question #8

Would you learn a lab experiment better if you…

B. Figured out the directions yourself

C. Watch the teacher demonstrate the experiment

This question could be biased because students may realize that they would have to read the directions in order to "figure out the directions." Kinesthetic learners in general are not drawn to reading, thus prefer in general to see or participate/help with the experiment initially. Watching the experiment does lean toward a visual learner, however, figuring it out themselves may cause students to have to learn through reading while trying to figure it out (Sturt 2003).

In viewing the results of the SAILS Survey, only fifteen of the fifty-five students (27.27%) selected the "B" (kinesthetic) answer.

The following two questions could be slanted in favor of the outgoing type of student; that often does not accurately describe the students of the carpentry program. Through personal observation and through personal conversation with SUNY Delhi carpentry faculty, these students are often reluctant to get involved in verbal discussions of more than a few words, and are extremely reluctant to give an oral report/presentation. One course taught at SUNY Delhi, titled *Construction Employment Skills* requires students to give an oral presentation as part of the class. Students very often express a dislike for this portion of the course. Both of the questions below require that a student "perform" which is something that these students appear to dislike doing, especially if given a choice. There have been times when students have chosen to accept a zero grade, in the above mentioned course, rather than give a presentation. (Personal communication with Bill Moyse, Professor, SUNY Delhi, 2-06)

Question # 9

Would you learn social studies better if you…

B. Role play as historical characters

C. Were shown slides and films of historical events

Forty-two of the fifty-five students (76.36%) indicated that they would rather be shown films. Speculation on this matter would hint that this high percentage could be based on the above reasoning/argument, and a lack of willingness to "perform" in front of the class. Students often show a lack of willingness to get involved in this way unless forced into it (Personal communication with Bill Moyse 2-06). What student wouldn't rather sit back, relax, and watch a film, instead of going through the work of preparing, then putting on a performance/presentation?

11. Which would you rather do…

A Listen to a presentation

B. Give a presentation

Forty-six of the Fifty-five students (83.64%) indicated they would rather listen to a presentation. Again, this could be due to a lack of willingness to perform in front of the class, or a lack of willingness to put forth unnecessary effort. This question also does not address the work

involved in giving a presentation. As above, what student wouldn't rather relax, and watch a presentation, instead of being burdened with all of the work required in putting together a presentation? A better question may ask: Would you rather give an oral report on a particular subject, *or* give a how-to demonstration? This would eliminate the choice of watching vs. working.

Question # 12 asks

12. Which would be easier for you to learn…

A. Words to a new song

B. Steps to a dance

Forty-eight of the Fifty-five students (87.27%) indicated they would rather learn words to a new song. In this day of IPODS, walkmans and other personal listening devices, music is readily available to students at nearly any time. Many students routinely carry these devices, turning them off only upon entering a classroom or laboratory. Some teachers even allow students to listen quietly while working on lab exercises (personal knowledge/observation).

In light of the above comments, three of the questions from the original SAILS survey were eliminated in order to determine if the overall results would change.

One question from each category of answers was deleted. One question, giving an option of an A or B (Audio/Kinesthetic) response, one giving an option of a B or C (Kinesthetic/Visual) response, and one giving an option of an A or C (audio/Visual) response.

Deletion of one question from each category, in theory, should not have a large effect on the outcome of the results. However, the changes in the results were quite dramatic.

Note: There are many possible combinations of questions that could have been chosen to delete. These three questions were chosen simply to test if there would indeed be a difference in the results, caused by eliminating one of each of the possible categories of answers.

Through the deletions of question numbers 5, 9, and 12, the modified survey has four AV questions (answer choice A or C), four AK questions (answer choices A or B), and four VK questions (answer choices B or C), giving a possible high score of 8 in each of the three classes (A, V, or K). The deletions of the three questions are the only changes made to the original test at this time.

Shown below is a chart that compares the original SAILS survey (fifteen questions), to the modified SAILS survey (twelve questions). This chart shows the average number of times each of the learning styles was chosen by each student.

Original Averages (15 questions		**Modified** Averages (12questions)	
Audio	4.36	Audio	3.49
Kinesthetic	4.71	**Kinesthetic**	**4.35**
Visual	**5.84**	Visual	4.11

The original averages show the visual tendency to be the highest average number among the students. After the elimination of the three questions, the new twelve question modified survey showed the kinesthetic tendency to be the highest.

When further comparing the data, the following results were noted.

Dominant Style	**Original** SAILS test	**Modified** SAILS test
	Fifteen Questions	Twelve Questions
V	27 (49.09%)	20 (36.36%)
A	9 (16.36%)	10 (18.18%)
K	11 (20%)	18 (**32.73%**)
KV	3 (5.45%)	0 (0%)
AV	2 (3.64%)	1 (1.82%)
AK	1 (1.82%)	1 (1.82%)
AVK	2 (3.64%)	5 (9.09%)

Note: In order for a student to be considered dominant in a particular category, they would have had to have a higher concentration of the survey answers in that particular learning style. For example, when using the fifteen question original SAILS survey, a student may have answered 3 questions with an "A" answer (indicating auditory), 5 questions with a "B" answer (indicating kinesthetic), and 7 questions with a "C" answer (indicating visual). The student in this example therefore would be considered Visual dominant.

When the modified SAILS survey (twelve question) was compared to the original SAILS survey (fifteen question), the visual preference remained the highest percentage on both the original and modified

surveys, however, the kinesthetic preference increased dramatically as an over all percentage and the visual decreased nearly an identical amount.

This was a striking change in the results caused by simply deleting one question from each of the three categories.

Furthermore, question F of the questionnaire, indicates that most of the carpentry student body view themselves as kinesthetic learners. As research by Dunn (1983) indicates, *students are able to accurately identify their preferred learning style.*

Self diagnosed results

Preference	Number of Students
V	5 (9.09%)
A	1 (1.82%)
K	49 (89.09%)

Style	**Original** SAILS test (Fifteen Questions)	**Modified** SAILS test (Twelve Questions)	Self Diagnosed
V	27 (49.09%)	20 (36.36%)	5 (9.09%)
A	9 (16.36%)	10 (18.18%)	1 (1.82%)
K	11 (20%)	18 (**32.73%**)	4 (89.09%)
KV	3 (5.45%)	0	
AV	2 (3.64%)	1 (1.82%)	
AK	1 (1.82%)	1 (1.82%)	
AVK	2 (3.64%)	5 (9.09%)	

Due to the gross discrepancy of the results noted when comparing the self diagnosed survey, to the SAILS survey, and to the modified SAILS survey, another (second) learning styles survey was administered.

Chapter 4

Part II

Second Survey Administration/Analysis

As one can see by viewing the results of the original SAILS survey, the outcome conflicts considerably with the students' self perception of their learning preferences. According to Dunn, (1983) students can correctly identify their preferred learning style. This may lean toward the

conclusion that the SAILS survey as administered is not a valid indicator for this particular group of students, or suggest that Dunn's research in 1983 was erroneous. This does not however, in any way suggest that the SAILS survey is not valid for other groups of students. Remember, SUNY Delhi is a unique college with many unique programs that may attract a higher percentage of kinesthetic learners than other colleges.

After reviewing the results of the original SAILS survey as compared to the self diagnosis, this author felt it necessary to rewrite and administer another survey to attempt to come closer to matching the results of the students own perception of their favored learning styles.

Note: *This rewritten SAILS survey from here on will be referred to as the "**Second Survey**" not to be confused with the original survey that was previously modified to a twelve question survey. Furthermore, this survey was rewritten by this author and is not intended to compete with the SAILS survey written by Seigel & Lester.*

For the second survey, some questions from the original SAILS survey were used, others were changed slightly for clarification, some questions were deleted and new ones written in their place..

The second survey was initially administered to a test group (2nd year students) in the carpentry program, in order to find flaws in the

language and administration process. After some minor altering, the final product is shown below.

Second Survey

Please circle the letter that most closely matches how you feel.

1. Do you follow…

B. Oral directions better

C. Written directions better

2. Which distracts you more when you are studying…

B. Loud noises

C. Flashing lights

3. Which do you notice first about people you are meeting for the first time…

B. The sound of their voices

C. Their facial features

4. Would you rather…

A Listen to the news/weather on the radio

C. Read about it in the newspaper

5. When you spell a word, do you…

B. Sound out the word

C. Write it down to find out if it looks right

6. Which do you prefer when learning…

B. Participating in an activity

C. Watching others participate in an activity

7. If you lost your keys, would you more likely…

B. Retrace your steps

C. Visualize where you left them

8. Would you learn a laboratory experiment better if you…

B. Helped demonstrate the experiment

C. Watched someone demonstrate the experiment

9. When seeing an object for the first time…

B. I often pick it up, or touch it to learn more

C. I can learn just as much by looking at it

10. When using a new tool, appliance or electronic device…

B. I learn by experimenting with its functions

C. I learn by following directions and illustrations

11. When I describe something…

A. I rarely use my hands

B. I often use my hands

12. When giving a presentation, I would rather…

A. Explain how to do something

B. Demonstrate how to do something

13. Which is the easier way for you to learn a new concept

A. By hearing it explained

B. By experiencing it in a real life situation

14. Which situation would enable you to study better…

A. A room in absolute silence

B. A place where there is room to move around

15. Would you learn more in a class that…

A. Has you listening to interesting speakers

B. Has you participating in interesting activities

16. What do you like to do in your spare time? You may list up to three things.

For the second survey, it must be noted that there were only fifty students present. For the original SAILS survey, there were fifty-five students present. It should be noted that five students could potentially alter the results up to ten percent.

The results of the second survey are as follows

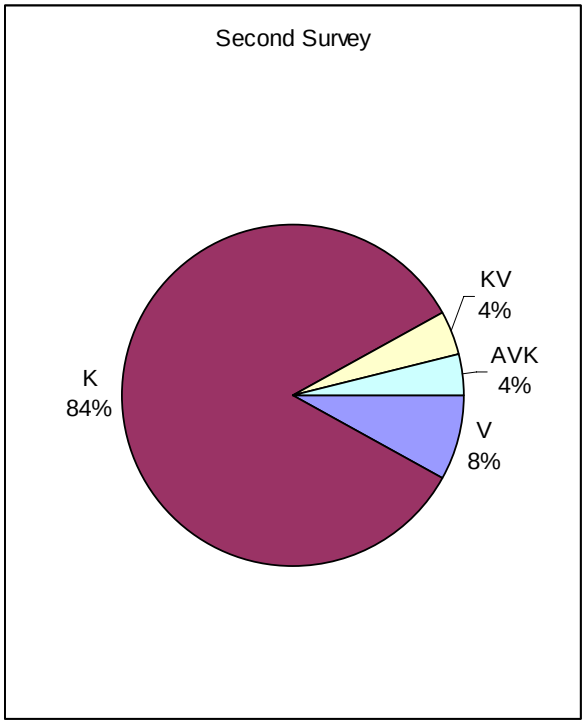
Preferred style	number of students	Percentage
Audio	0	0%
Visual	4	8%
Kinesthetic	42	84%
V/K	2	4%
A/V/K	2	4%

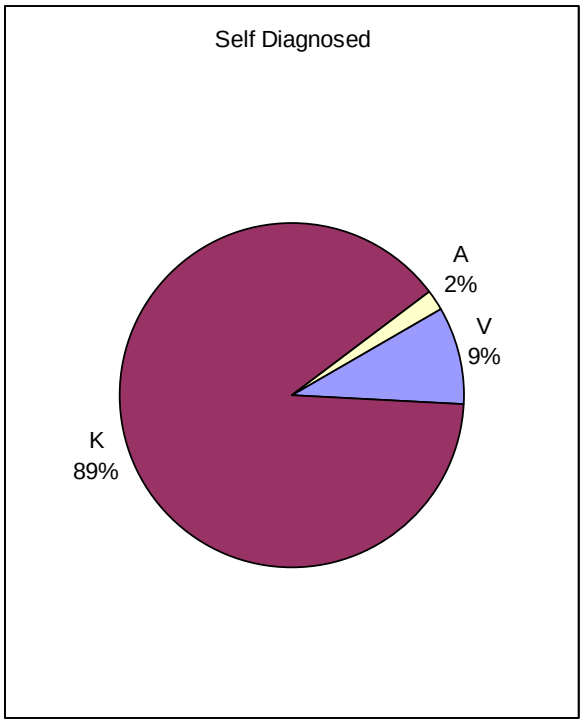
Here is a chart comparing the two surveys and the self diagnosed questionnaire.

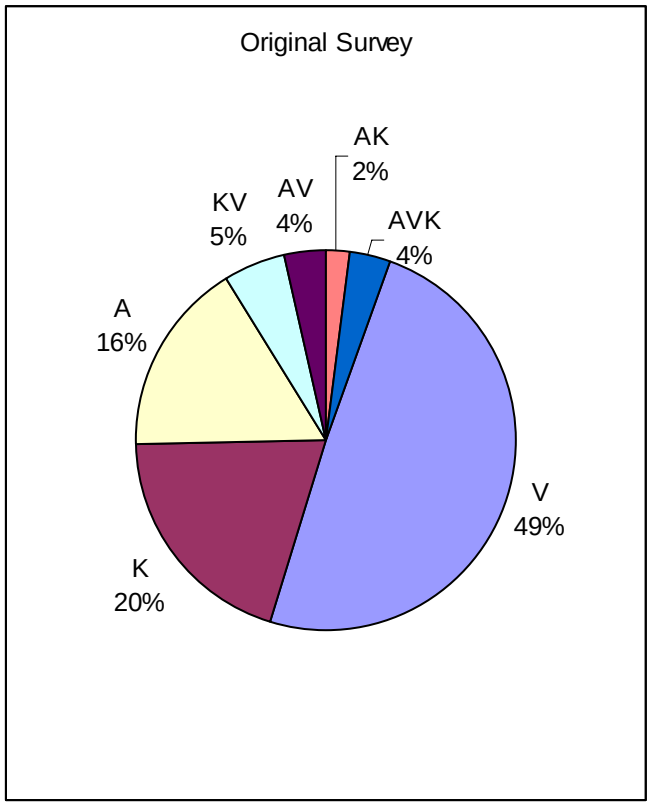
Style	**Original** SAILS test	Second Survey	Self Diagnosed
V	27 (49.09%)	4 (8%)	5 (9.09%)
A	9 (16.36%)	0 (0%)	1 (1.82%)
K	11 (20%)	42 (84%)	49 (89.09%)
KV	3 (5.45%)	2 (4%)	N/A
AV	2 (3.64%)	0 (0%)	N/A
AK	1 (1.82%)	0 (0%)	N/A
AVK	2 (3.64%)	2 (4%)	N/A

As one can see by the results, when comparing percentages, the self diagnosed results now very closely match the second survey. This would indicate validity between the self diagnosis and the second survey. Furthermore, should these results be determined to be valid, one could conclude that there is indeed a very high percentage of kinesthetic learners in the carpentry program at SUNY Delhi. This supports the first hypothesis in chapter one of this study.

The pie charts on the following page dramatically show the similarities of the second survey when compared to the questionnaire.


Second Survey
KV
4%
AVK
4%
V
8%
K
84%


Self Diagnosed
A
2%
V
9%
K
89%



On the other hand, the original survey when compared to the others (in pie chart form) shows dramatic dissimilarities.

Other statistics gathered from the test are as follows:

Average age per student is 19.1 years old.

Two students indicated a preference for lecture classes over laboratory classes. Fifty students indicated a preference for laboratory classes over lecture classes, and three students indicated no preference. This supports hypothesis number seven in chapter one of this study.

Two students indicated that they scored better in lecture classes, while forty eight students indicated that they score better in laboratory classes. The remaining five students felt their scores were the same in both classes.

Chapter 4

Part III

Grade Data Analysis

For the following text, the term “significantly better” refers to a grade difference of a minimum of ½ letter grade. For example, a “B-“ to a “B”, or from a “B+” to an “A-“. Scores that are stated to be the same simply means that the scores were both within the same letter grade

range. For example in order to receive a B-, a student would have an average grade between 79.5 and 82.0.

For the following text, the term "performs well" refers to a student who received a grade of a B- or better in the class. Likewise, the term "performs poorly" refers to a student who received a grade of C+ or worse in the class.

This portion of the study will show class and laboratory grade data, collected at the end of the fall semester of 2005, then plotted on scatter plots and further analyzed. Correlations will be identified between the laboratory and classroom grade data.

The grade data represents all 67 students who completed the first semester of the carpentry program. Each student earned grades based upon performance in the laboratory and the lecture courses. The final grades were awarded as letter grades. For the purpose of this study it was easier to convert those grades to number-equivalent grades. Following are the number equivalents that represent each of the letter grades.

A 92.1 or higher

A- 89.5 – 92.0

B+ 86.9 – 89.4

B 82.1 – 86.8

B- 79.5 – 82.0

C+ 76.9 – 79.4

C 72.1 – 76.8

C- 69.5 – 72.0

D+ 66.9 – 69.4

D 62.1 – 66.8

D- 59.5 – 62.0

F Less than 59.5

To further simplify matters, any student receiving a grade of "A" was given the minimum value of the "A" grade. For example A = 92.1, A- = 89.5, B+ = 86.9, and so on. Furthermore all grades of "F" were assigned a value of 50. Through personal knowledge, in is known that some of the "F" grades were well below the assigned value of 50. Some of the very low grades were due to non-attendance, such as a student who quit coming to class but never officially dropped the course.

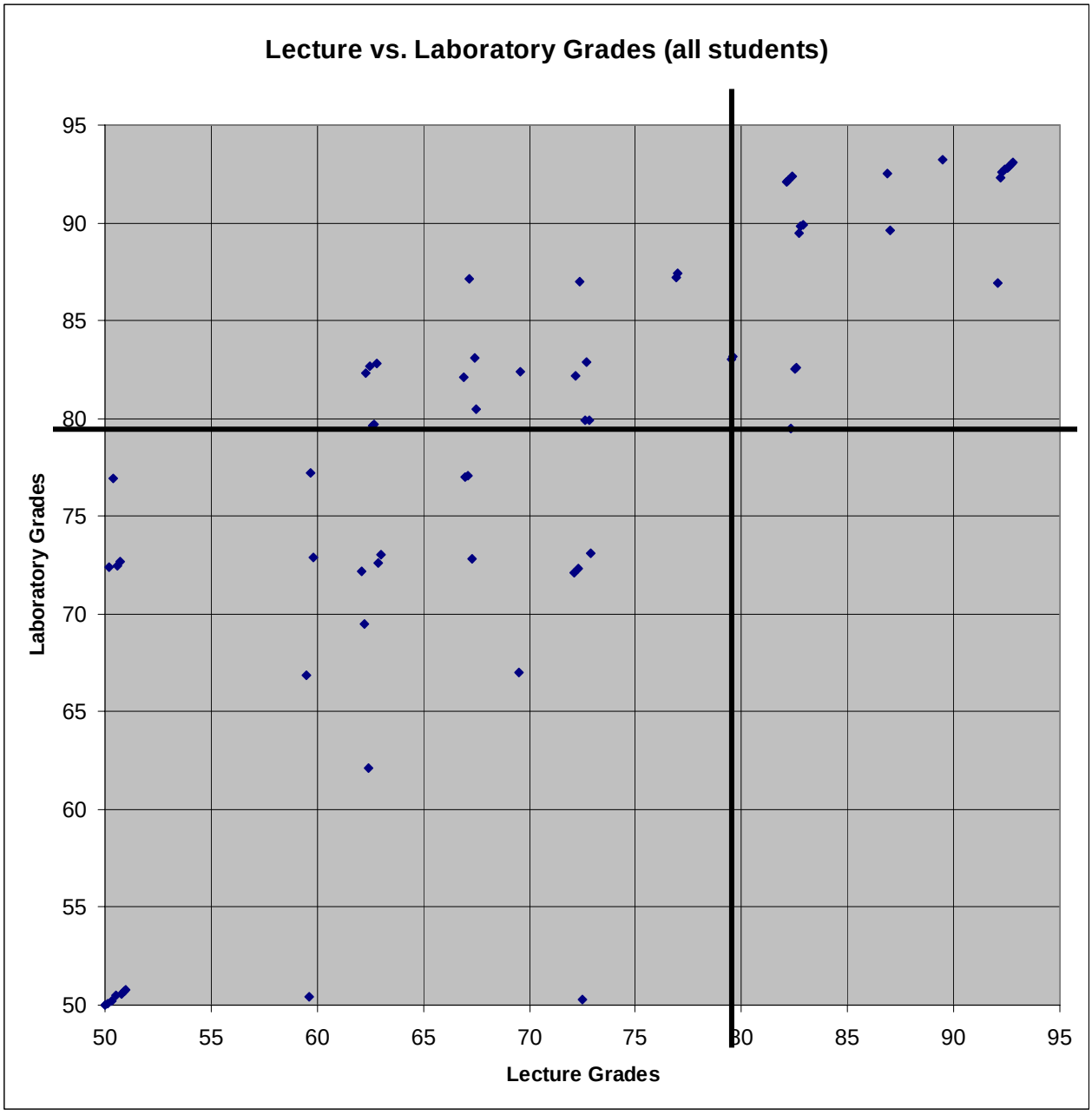
By assigning "F" grades an equivalent number of no less than 50, the 0-50 portion of the plot need not be shown and this allows for a larger scale diagram to be shown, making plots farther apart, and the diagram easier to read.

When quoting grade averages throughout this paper, the raw data (found at the end of this section) is always used, however in order to distinctly show each student on the scatter plots, the first student (on the grade list) receiving an A was assigned the value of 92.1, the second, a value of 92.2, the third a value of 92.3. Likewise, the first student (on the list) receiving a grade of C was assigned the value of 72.1, the second the value of 72.2, etc. The same process was followed for all of the grades, this way, each student will have a unique score and one plot will not exactly overlay and obscure another plot.

Now when viewing the scatter plots, a tight cluster may appear where before, a single plot would have appeared. This will make the plot easier to read and to accurately determine how many students are represented at a particular grade level.

This first scatter plot (Diagram 1) is simply to be used as a baseline so that all students within the study group are represented on one plot. This will give the reader an overall view of all grades.

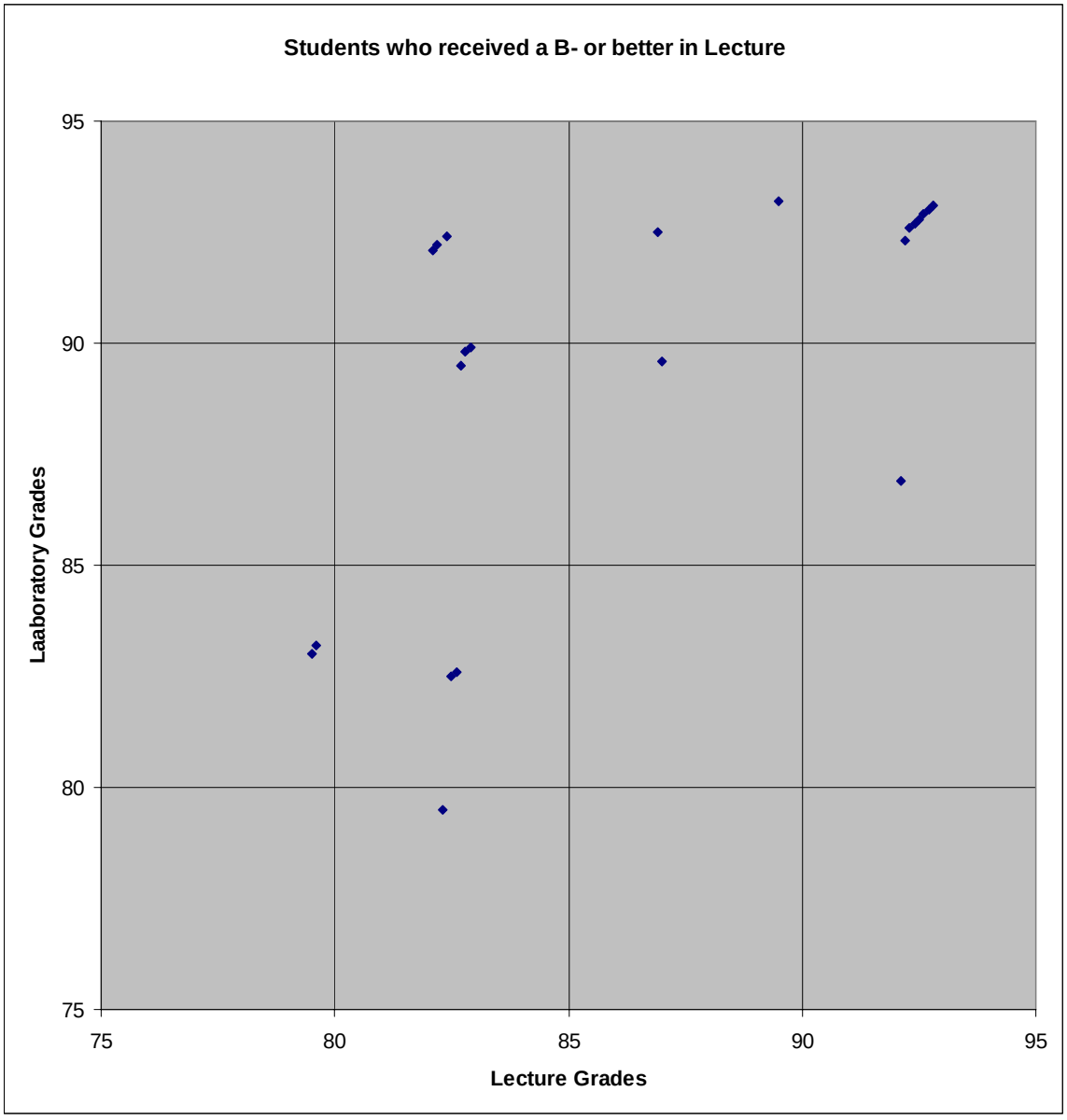
Diagram 1


Lecture vs. Laboratory Grades (all students)
Laboratory Grades
Lecture Grades
95
90
85
80
75
70
65
60
55
50
50
55
60
65
70
75
80
85
90
95

Note: on all scatter plots of this series, the laboratory grades will always be shown on the vertical axis and the lecture grades on the horizontal axis. The bold lines, when shown, represent a grade of B-.

The following scatter plot (Diagram 2) shows all students who received a B- (79.5) or better in lecture, and their corresponding grades in the laboratory.

Diagram 2



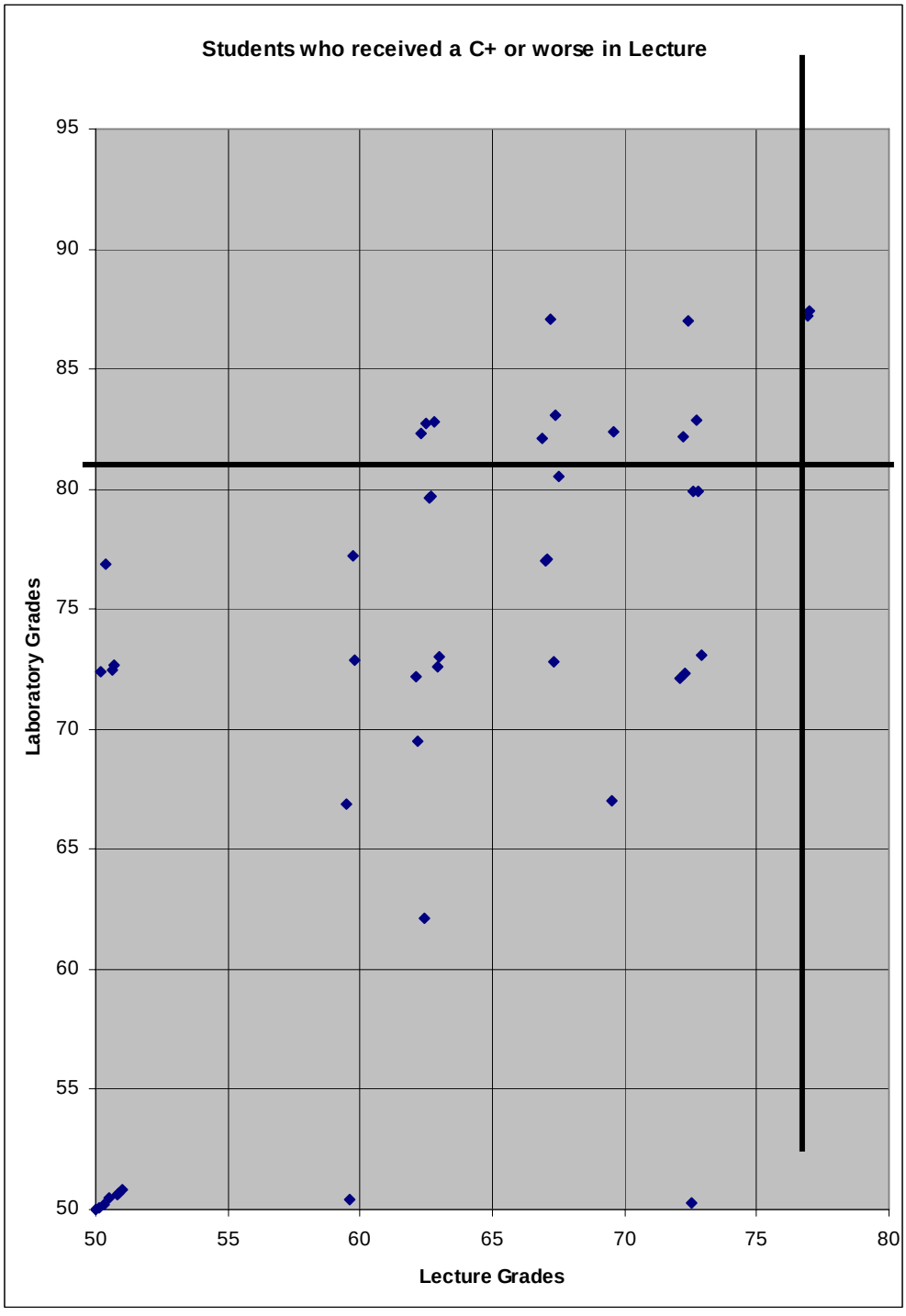
In analyzing the above scatter plot titled one can derive the following statements:

No student who scored a B- or above in lecture, scored below a B- in laboratory.

Therefore, it appears that a student who performs well in lecture will also likely perform well in the laboratory. This supports hypothesis number three in chapter one of this study.

The following scatter plot (Diagram 3) shows students who received a C+ (79.4) or worse in lecture, and their corresponding grades in the laboratory.

Diagram 3



The two bold lines represent a B- grade.

In analyzing the above scatter plot (Diagram 3) one can make the following observations:

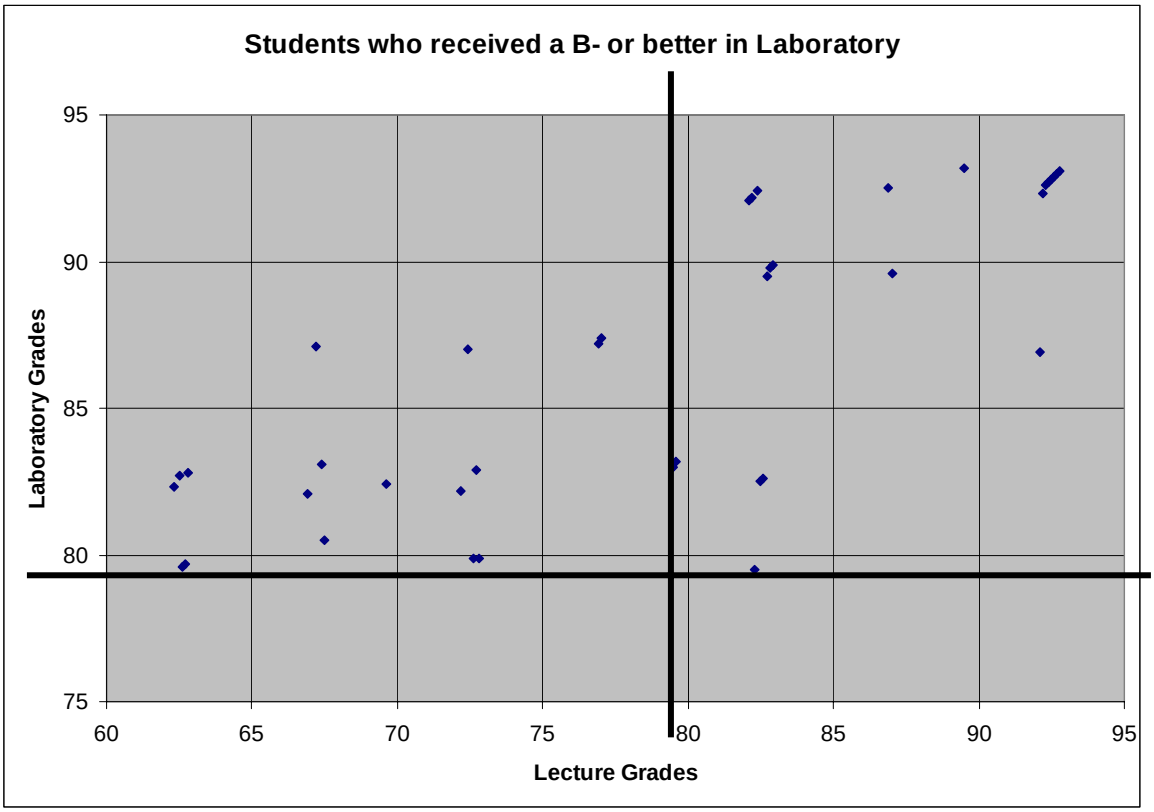
Students who received a C+ or worse in lecture did not necessarily also perform poorly in the laboratory. *As one can see, many students who scored a C+ or below in lecture, received a grade of B- or above in laboratory.*

The raw data shows that only three students scored significantly better in the lecture course than in the laboratory course. Therefore, it appears that a student who performs poorly in lecture does not necessarily also perform poorly in the laboratory. This supports hypothesis number five in chapter one of this study.

The raw data also shows that Twenty six students of the forty five scored an entire letter grade higher in laboratory than in lecture and an additional six students scored at least a half letter grade better in laboratory.

The following scatter plot (Diagram 4) shows students who received a B- or better in laboratory, and their corresponding grades in lecture.

Diagram 4



The two bold lines represent a B- grade.

In analyzing the above scatter plot, one can derive the following statements:

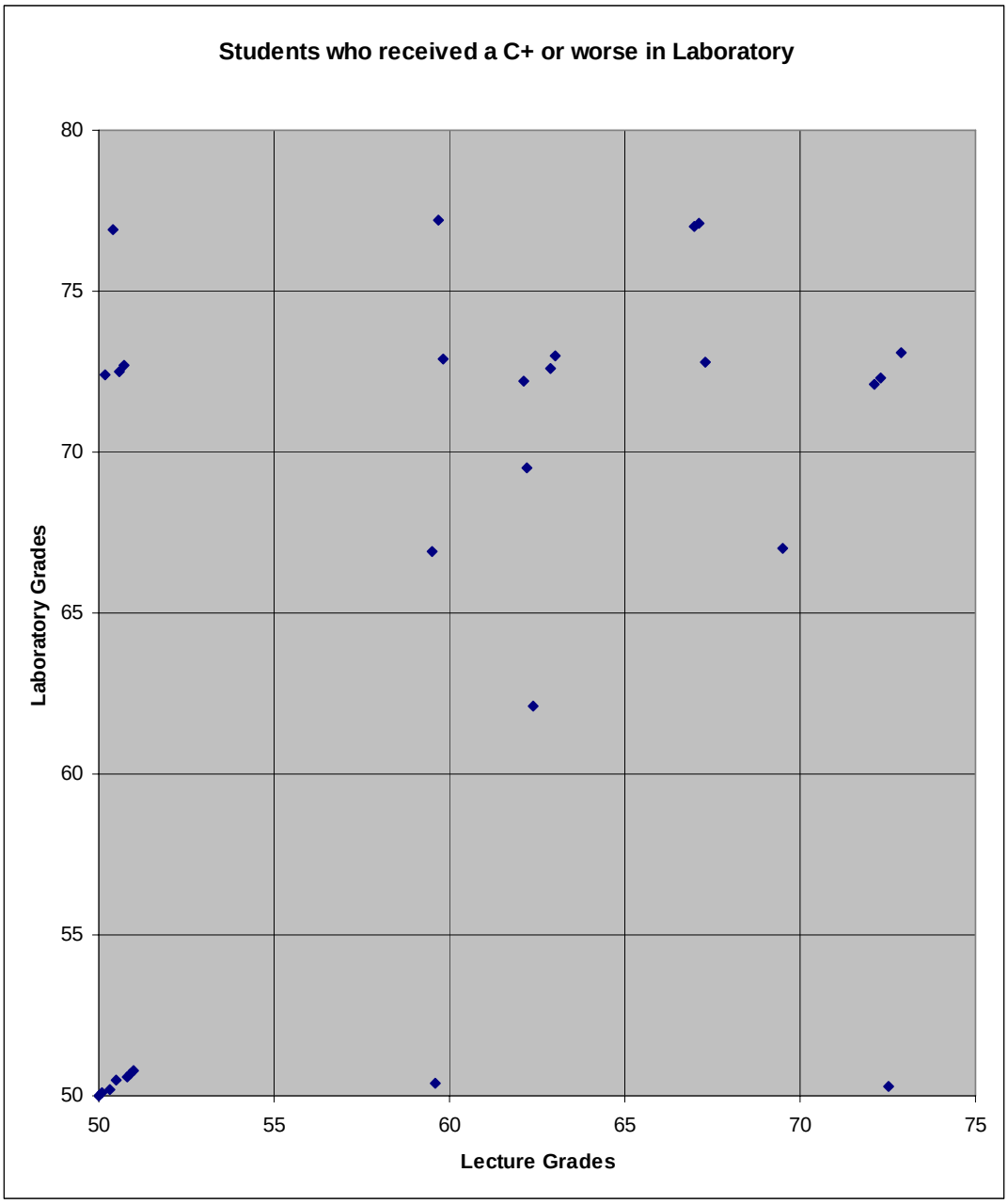
Students who received a B- or better in laboratory did not necessarily also perform well in lecture.

The raw data shows that of the thirty nine students scoring a B- or better in laboratory, seventeen scored a C+ or below in lecture.

Therefore, it appears that a student who performs well in the laboratory will not necessarily also perform well in the lecture. This supports hypothesis number six in chapter one of this study.

The following scatter plot (Diagram 5) shows students who received a C+ or worse in laboratory.

Diagram 5



In analyzing the above scatter plot and the raw data, one can derive the following statements:

Of the twenty eight students who received a C+ or worse in laboratory, none received a grade better than a C+ in lecture. Therefore, a student who performs poorly in the laboratory is also likely to perform poorly in the lecture. This supports hypothesis number four in chapter one of this study.

Future Questions/Future Studies

Perhaps through further analysis of statistical data that is beyond the scope of this study, a researcher could focus upon identifying what other characteristics students display that perform well in lecture settings. With this knowledge, a type of a backwards analysis known as *Ex-post facto research* could be performed in order to identify good candidates of incoming freshmen. For example, a study could focus on commonalities that good lecture performers have. Did they have good math/science grades in high school? The reverse correlations could also be done with poor laboratory performers. For example, did the poor laboratory performers also perform poorly in physical education in high school? Information such as this may be valuable for the admissions

staff at the college. Future studies such as this may be able to help to increase in retention.

Teachers may also have an active role in finding innovative ways to reach the students who are statistically likely to perform poorly. If these students are identified early on as being at risk of performing poorly, steps may be taken to insure that they do not get overlooked until it is too late to help them.

Following is the raw data from which all of the above information including the scatter plots was derived.

Raw Data

CARP	Number	CARP	Number
130	Grade	140	Grade
Letter Grade		Letter Grade	
Lecture	Lecture	Lab	Lab
C	72.1	C	72.1
B	82.1	A	92.1
A	92.1	B+	86.9

D-	59.5	D+	66.9
C-	69.5	D+	66.9
B	82.1	A-	92.1
D+	66.9	B	82.1
F	50	F	50
B	82.1	B-	79.5
C	72.1	B	82.1
D	62.1	C	72.1
D	62.1	C-	69.5
C	62.1	B	82.1
C-	69.5	B	82.1
C	72.1	C	72.1
A	92.1	A	92.1
B	82.1	A	92.1
F	50	F	50
D	62.1	D	62.1
B+	86.9	A	92.1
A	92.1	A	92.1
B	82.1		82.1
B	82.1	B	82.1
D	62.1	B	82.1

F	50	C	72.1
F	50	F	50
B	82.1	A-	89.5
F	50	C+	76.9
D	62.1	B-	79.5
C	72.1	B+	86.9
A	92.1	A	92.1
D+	66.9	C+	76.9
C	72.1	F	50
D+	66.9	C+	76.9
D-	59.5	F	50
F	50	F	50
D	62.1	B-	79.5
D	62.1	B	82.1
D+	66.9	B+	86.9
C	72.1	B-	79.5
F	50	C	72.1
B+	86.9	A-	89.5
C	72.1	B	82.1
C	72.1	B-	79.5
D	62.1	C	72.1

D-	59.5	C+	76.9
A	92.1	A	92.1
F	50	C	72.1
B-	79.5	B	82.1
D+	66.9	C	72.1
F	50	F	50
A	92.1	A	92.1
D+	66.9	B	82.1
F	50	F	50
D-	59.5	C	72.1
A	92.1	A	92.1
A	92.1	A	92.1
C+	76.9	B+	86.9
D	62.1	C	72.1
F	50	F	50
B	82.1	A-	89.5
B	82.1	A-	89.5
C	72.1	C	72.1
A-	89.5	A	92.1
B-	79.5	B	82.1
C+	76.9	B+	86.9

D+	66.9	B-	79.5

Total – 67 students

Following is supplemental statistical information gathered from the raw data.

For students who scored a 79.5 (B-) or **better in lecture**. Averages indicate 86.3 in lecture vs. 89 in lab. In looking at a side by side comparison, out of twenty two students, two students scored significantly better in lecture, eleven scored significantly better in lab, and nine scored the same (within ½ letter grade) in both courses.

For students who scored 79.4 (C+) or worse in lecture. Averages indicate 62.6 in lecture vs. 71.5 in lab. In looking at a side by side comparison, out of forty five students, three scored significantly better in lecture, thirty two scored significantly better in lab, and ten scored the same in both courses.

For students who scored 79.5 (B-) or better in lab. Averages indicate 86.2 in lab vs. 78.5 in lecture. In looking at side by side comparison, out of the thirty nine students, twenty eight scored significantly better in lab, two scored significantly better in lecture, and nine scored the same in both courses.

For students who scored 79.4 (C+) or worse in lab. Averages indicate 64.9 in lab vs. 59.2 in lecture. In looking at a side by side comparison, out of the twenty eight students, fourteen scored significantly better in lab, three scored significantly better in lecture, and eleven scored the same in both courses. The above statements support hypothesis number two in chapter one of this study.

This information was simply derived from direct comparisons that gave an indication of performance in lecture class vs. laboratory.

Typically kinesthetic learners are more comfortable and excel in laboratory environments and this data appears to compliment that research (Sturt, 2003).

Chapter 5

Helping the Hands-on Learner in a Lecture Setting

This chapter will describe characteristics of the kinesthetic learner and focus on how an educator can help the kinesthetic learner in the classroom.

It would be an over simplification to make the assumption that all trades people are kinesthetic learners, however this study shows there is evidence that many are. Kinesthetic learners are by far the most difficult to reach in a lecture setting, they generally do not like to take notes, and they have difficulty understanding concepts by listening. They tend to best learn what they do, not what they see or hear. They may quickly loose interest in watching a lesson that they are not involved in (Sturt, 2003). Their curriculum, such as the Carpentry program at SUNY Delhi, may require them to spend time learning theory in a classroom setting, as well as a hands-on effort in a laboratory setting. Often they will excel in the laboratory setting but perform significantly worse in a classroom setting. ("Learning Styles and Strategies," n.d.), (also see Diagram 4,

Chapter 4 of this study). Kinesthetic learners are generally not eager to read, and may even have some difficulties in this area. They often are often poor spellers. They may tend to get involved in sports or other extra curricular activities. Often they can be seen tapping their pencil, feet, or some other type of continuous movement. (Teaching and Learning Center, n.d.).

None of the above is meant to suggest that one learning style is superior to another, Fisher & Fisher (1979) state that a common misconception may be "the association of intelligence with a particular style of learning – an erroneous notion often used to bolster one's performance for one learning style over another…It is safe to assert that high intelligence is useful in any style of learning."

Audio and visual learners, who typically benefit more from lectures than a kinesthetic learner, also tend to be able to accomplish the laboratory work (see diagram 2, chapter 4 of this paper). This may be a result of, when entering the laboratory they often have a head start on the kinesthetic learners. The audio and visual learners may have heard and/or read the instructions, and as a result, are better mentally prepared for the task when entering the laboratory. The audio and visual learners may, or may not, have the hand skills that the kinesthetic learners have, but with the better use of laboratory time, such as being

prepared or being able to easily follow written directions, they are able to accomplish the laboratory tasks in the given time (Johnson, Johnson & Smith, 1991).

Lectures tend to best reach auditory learners; if the instructor chooses to use visuals such as overheads, video clips, or physical objects, the visual learner also benefits (Wirth, 2005). "When it comes to school, however, instead of allowing students to learn by doing, we create courses of instruction that tell students about the theory of the task without concentrating on the doing of the task. It's not easy to see how to apply apprenticeship to mass education. So in its place, we lecture." (Cleary, C. & Schank, R., n. d.). This leaves the kinesthetic learner at a disadvantage during a lecture. Educators will agree that all students do not perform equally. Therefore, they expect to have some students who perform at lower and higher levels. Mind Tools website reports that as a total of the whole population, it is thought that kinesthetic learners make up only five percent ("How your learning style affects your use of mnemonics," n.d.) Teachers, do not tend to become alarmed when five percent of a class struggles with concepts. The attitude can be one that ninety five percent of the students understand the concepts. Kinesthetic learners, making up such a small percentage of the population as a whole can get lost in the cracks. These students will have a historical

background of being poor spellers, having a seemingly poor attention span, and not being able to sit still. "Too many teachers think of students as a featureless mass; too many rarely vary their teaching methods, thinking that the method by which they were taught is best for everyone." (McKeachie, 1995).

What Can Educators Do?

Throughout history, people have apprenticed under masters to learn trades. They learned the trades by doing the task (Scott & Sarkees-Wircenski, 2001). Today while many programs do have hands-on laboratory exercises to supplement learning, they also have required complimentary lecture theory. A result of this is there are nearly always students in classrooms, who are apparently taking a course because it is required for their program of study. Many of these students show little interest in learning the supplemental information outside of a laboratory setting.

In order to promote learning for all students, teachers should, from the first lecture let the relevance of each subject area be known, even if the subject is simply a stepping stone (something students need to know in order to progress to the next step). This can be further enhanced by

personal experiences, and real-life applications. It is extremely important that students know WHY they are learning, WHY they are studying, WHY they have to put forth effort. ." (Speaking of Teaching, Fall 1998). "Students who learned text material in order to put it into use reported more intrinsic motivation for learning and showed greater conceptual understanding than did students who learned the material in order to be tested" (Deci, Vallerand, Pelletier, & Ryan, 1992). In view of this, students also need to understand the relevance of homework assignments, and projects; so it is not viewed as busywork.

Expectations of the teacher also have to be known by the student. A teacher's expectations can have a positive relationship on student performance. Learning goals, have to be realistic, and within reach of the students. If these goals are set too high, they can have a negative effect on motivation. Setting goals too high may have the same effect as approaching the goals too rapidly. The pace that the material is presented to the students is very important. Skills and concepts need to be introduced at a gradual rate that the student finds manageable; this may allow motivation to remain. Too rapidly, and motivation can diminish. (Speaking of Teaching, Fall 1998).

As the responsibility of learning the presented material must in large part rest on the student, educators can contribute to student's

success by helping them to be involved with the lesson; this will help the motivation level also. To reach all students, a teacher could simultaneously use tactics such as lecture (auditory), visuals, such as overheads (visual), and continuous interaction with the students (kinesthetic).

In order to help kinesthetic learners in the classroom, there are many ways the teacher can assist. Kinesthetic learners may prefer to present a demonstration instead completing a reading/writing report ("Learning Styles and Strategies," n.d.). They may also prefer to experiment through trial and error, or discovery methods, instead of following a step-by-step process (Sturt, 2003). The kinesthetic learner will benefit from watching diagrams be drawn by the teacher; then copying it themselves, instead of receiving a pre-diagramed handout sheet. This will keep them occupied and concentrating on a task. They will also prefer the use of current affairs and real life examples instead of abstract situations. For example, kinesthetic learners tend to enjoy field trips and studying relevant topics that have personal meaning to them that they can apply to their lives or education. Examples in the textbook will likely hold their interest better that just written theory, especially when supplemental graphics and pictures are utilized. An interactive website may also help (St. Hill, 2000).

How can Kinesthetic Learners Help Themselves?

There are many strategies kinesthetic learners can utilize to help themselves to succeed, if they know how. Kinesthetic learners should sit towards the front of the classroom, this will hinder distractions, and they should be kept busy by drawing color (using colors is important) diagrams, pictures, and charts that aid in understanding the material ("Learning Styles and Strategies," n.d.). They should also make lists, recopy notes and use flashcards; this repetitive process will promote learning. These students will also benefit from reviewing or recopying notes as soon as possible after the lecture. Using computers for note-taking and for assignments can help them by allowing them to use their sense of touch on the keyboard (Learner Support Center, n.d.). Touching and handling instructional objects is important. These students may also benefit from using musical rhythms to aid in memorization, and by playing educational games (Teaching and Learning Center, n.d.) Talking aloud about what s/he is learning will also facilitate learning (Learner Support Center n.d.). The kinesthetic learner will benefit from recording lectures then listening to them while walking or running, even better than when sitting still. Some find it helpful to hold a book while reading instead of letting it lie stationary on a table. Frequent breaks (every

fifteen minutes) may be necessary to help them to stay on task. Background music may help them to concentrate (Teaching and Learning Center, n.d.). Kinesthetic learners should study in groups whenever possible and try to teach each-other the material being studied (Learner Suport Center n.d.).

Other Opinions/Ideas

According to McKeachie (1995), students also need to be taught ways to learn using methods that are not their preferred learning style. It may not be as helpful as we think to match teaching to learning style. He states, "Learning styles are preferences and habits…and everyone is capable of going beyond the particular style…Regardless of their learning styles students can learn strategies that enable them to be effective when taught by methods that are not compatible with their preferred style." (p.2). This view is shared by Neil Fleming, and Colleen Mills (1992 p. 138):

> "Our collective observational experiences as teacher trainees and as an inspector of secondary schools in over 8,000 classrooms…have reinforced our belief that it is simply not realistic

> to expect teachers to provide programs that accommodate the learning style diversity present in their classes, even if they can establish the nature and extent of that diversity. We have come to the conclusion that the most realistic approach to the accommodation of learning styles in teaching programs should involve empowering students through knowledge of their own learning styles too adjust their learning behavior to the learning programs they encounter…we believe in assisting students to know themselves and to operate in a meta-cognitive fashion to make adjustments in their learning behaviors."

According to McKeachee, Fleming & Mills, it may not be practical for each teacher to teach learning strategies, however, somewhere along the way students need to be taught. At the University of Michigan, there is a course titled *Learning to Learn*, the course includes motivational strategies, organizational strategies, and learning techniques (McKeachie, 1995). Courses like this can give the student increased awareness of their own learning style, and give them suggestions for changing their preferred style to match different teaching styles.

Even though trade related programs such as SUNY Delhi's carpentry program, appear likely to attract a high percentage of

kinesthetic learners, teachers need to design their presentations with all learning types in mind. Furthermore, schools need to get involved and attempt to teach all learners how to learn using alternate learning methods. Through this, more students will be reached. As McKeachie wrote, "Good teaching involves more than communicating the content of one's discipline; a good teacher also needs both to motivate students to continue learning and to teach them the skills and strategies needed for continued learning." (p.3, 1995).

References

Addison, D. (2005, October) Personal communication with Dr. David Addison, Dean of Technology at State University of New York at Delhi, Delhi, NY

Ary, D., Jacobs, L., Razavieh, A., Sorensen, C. (2006) Introduction to Research in Education. (7th Edition). Canada: Thompson.

Basualdo, E. (n.d.). How People Learn. unpublished paper. State University of New York at Oswego.

Bogod, E., Brevard College, NC., (2002). *What is your Learning Style*. Retrieved November 3, 2005 from http://brevard.edu/fyc/resources/Learningstyleinstruments.htm

Campbell, L., Campbell, B., Dickinson, D., (1998) Teaching and Learning Through Multiple Intelligences (2nd. Edition). New York: Allyn & Bacon.

Cleary, C. & Schank, R. (n.d.). Learning by doing, *Engines for Education*. Retrieved February, 13, 2006, from www.engines4ed.org/hyperbook/nodes/NODE-120-pg.html

Deci, E., Vallerand, R., Pelletier, L., and Ryan, R, (1991). Motivation and education: The self-determination perspective. Educational Psychologist, 1991, 26 (3 & 4), 325-346.

Dunn, R. "Can Students Identify Their Own Learning Style?" Educational Leadership. 1983, 40, (5).

Felder, M., Soloman, B. (n.d.) Index of Learning Styles on-line instrument used to assess learning preferences. NC State University. Retrieved October 19, 2005 from http://www.engr.ncsu.edu/learningstyles/ilsweb.html

Fischer, B., Fischer, L. "Styles in Teaching and Learning," Educational Leadership. 1979, 36, (4) p. 245.

Fleming, Neil D. & Mills, Colleen (1992). Not another inventory, rather a catalysts for reflection. *To Improve the Academy*, Vol II, pp. 137

Glass S., (2003, March). The Uses and Applications of Learning Technologies in the Modern Classroom: Finding a Common Ground Between Kinaesthetic and Theoretical Delivery., (ERIC Document Reproduction Service No. ED477398)

Johnson, D.W., Johnson, R., & Smith, K (1991). Active learning: Cooperation in the college classroom. Edina, Minnesota: Interaction Book. Learning styles and strategies, (n.d). Retrieved February, 13, 2003 from, www.etln.org.uk/page33.html

Kentucky Community and Technical College system. Owensboro Community College, Teaching and Learning Center. *Learning Styles*. Retrieved October 12, 2005 from

http://www.octc.kctcs.edu/tlc/Learning%20Styles/tlclearningstyles.htm

Learning Styles Inventory Workshop, (n.d.) Learner Support Center, University of Ontairo, Retrieved September, 26, 2005 from, http://www.dcuoit.ca/EN/main/learnersupportcentre/84673/learning_styles_inventory_workshop.html

Learning styles and strategies, (n.d). The Effective Teaching & Learning Network, Retrieved February, 13, 2006 from, http://www.etln.org.uk/resources/page18.html

McKeachie, W., J., (1995). Learning styles can become learning strategies, Vol.4, No.6. Retrieved October 12, 2005 from, http://www.ntlf.com/html/pi/9511/article1.htm

Plecas, J., (2002, April). More than Words., Retrieved October 12, 2005, from http://www.mesa.edu.au/conf2002/plecas.pdf

Sage, N.A. (1999). Understanding Your Learning Style. Retrieved October 12, 2005, from http://www.psy.pdx.edu/PsyTutor/StudyTips/LearnStyle.htm

Scott, J., & Sarkees-Wircenski, M., (2001). Overview of Career and Technical Education. 2nd ed. Homewood: American Technical

Siegel, J., & Lester, S., (1994). The Self Administered Inventory of Learning Strengths for College Students., (ERIC Document Reproduction Service No. ED372080)

Slavin, R. E. (2003). Educational Psychology: Theory and Practice. 7thed.)New York: Allyn and Bacon

Speaking of teaching, *Center for Teaching and Learning*, (Fall 1998) Vol. 10, No. 1. Retrieved February, 13, 2006, from http://ctl.stanford.edu/teach/speak/stfall98.pdf

State University of New York, (2005a). Technology Colleges. Retrieved November,11, 2005, from http://suny.edu/Student/campuses sector intro.cfm?mapToDisplay=tc

State University of New York, (2005b). Technology Colleges. Retrieved November 11, 2005, from http://suny.edu/Student/viewbook,cfm

Sturt, G., (2003). Learning styles. Retrieved February, 20, 2006, from www.garysturt.free-online.co.uk/learnsty.htm

Teaching and Learning Center, (n.d.), Owensboro Community & Technical College. Retrieved 11-28-05 from http://www.octc.kctcs.edu/tlc/Learning%20Styles/tlclearningstyles.htm

Wirth, K., (2005). Learning to Learn. Macalester College website. Retrieved10-21-05 from http://www.macalester.edu/geology/wirth/learning.pdf

Villems, A., (2000, April, 9). Central and Eastern European Networking Association. Advanced Networking for Excellence in Science and Education. Learning Style Inventories. Retrieved October 12, 2005 from http://www.ceenet.org/workshops/lectures2000/Anne_Villems/About_Learning_style.htm