5-1-2006

Comparing Computer Aided Drafting Curriculum of Maquoketa Community School District in Relation to Twenty Other Schools' Computer Aided Drafting Programs in the State of Iowa

Rhonda S. Welford
University of Northern Iowa

Comparing Computer Aided Drafting Curriculum of Maquoketa Community School District in Relation to Twenty Other Schools' Computer Aided Drafting Programs in the State of Iowa

Abstract

This study was to compare the Industrial Technology course offerings of computer aided drafting (CAD) courses at Maquoketa Community School District (MCSD) to the CAD courses offered at other high schools in the state of Iowa. The twenty school districts in Iowa which served as the basis for the study, are common in size and demographical area.

COMPARING COMPUTER AIDED DRAFTING CURRICULUM OF MAQUOKETA COMMUNITY SCHOOL DISTRICT IN RELATION TO TWENTY OTHER SCHOOLS' COMPUTER AIDED DRAFTING PROGRAMS IN THE STATE OF IOWA

A Research Proposal for Presentation
to the Graduate Faculty of the
Department of Industrial Technology
University of Northern Iowa

Submitted in Partial Fulfillment for
the Non-Thesis Master's of Arts Degree

Rhonda S. Welford

May 1, 2006

Approved by:

(Name) Advisor

5-1-06
Date

(Name) Graduate Faculty

5/1/06
Date

TABLE OF CONTENTS

LIST OF FIGURES

CHAPTER I

INTRODUCTION

Industrial Technology Education can be traced back to the primitive man. Primitive men would teach their sons all the crafts their fathers knew. These crafts were a necessary part of life and family. When fire was discovered, new developments were made. People learned they could cook, smelt metals, and make better tools with fire. These new discoveries created divisions of labor. As a result, people were broken into groups where some made the tools, some took care of smelting the metals, and some did the cooking (Bennett 1926).

Time went by and man became more civilized. Ancient Jews sent their boys to school for two hours a day, so they could spend the rest of the day learning their fathers' crafts (Bennett 1926). These ancient people knew the importance of the relationship between manual/training skills and intellectual development. In 300 BC Greeks were teaching drawing. In addition, the Christian Monks prayed and worked in various trades and field labor (Bennett 1926). Benedictines in 529 BC believed one of the cardinal principles was manual shop (Bennett 1926). Improvements with agriculture were made along with the building of roads and bridges.

As time went by the monks had to build their own buildings, and eventually, they began designing or creating building plans for churches and convents. They were also the supervisors for these building projects and directed the workers. Besides expanding buildings for the monks as they grew, they also worked on developing a printing process for duplication of manuscripts. Their writings were bound into books. These books were expressions of their lives and beliefs, and their work on constructing their buildings.

In the early 1400's, the two ideas of manual arts were the sense of expression, which was the basic knowledge and "learning by doing" (Bennett 1926). At this time only boys were going to school and learning the crafts of their fathers. Martin Luther believed both girls and boys should go to school, and whether they were rich or poor did not matter (Bennett 1926). The school day was not lengthened because the boys still needed to learn their fathers' trades. In the 1500's, science was the basis for education (Bennett 1926). The three greatest learning tools were believed to be the hand, eye, and ear (Bennett 1926). Elementary schools were organized with the curriculum consisting of reading, writing, drawing, singing, and playing of instruments. This was the first time drawing was part of the fundamental curriculum in the European setting (Bennett 1926).

Here in the United States, New Mexico had the Franciscan Schools. These schools were industrial schools, a degraded form of the European Monastic schools (Bennett 1926). The schools taught children up to nine years old how to read, write, sing, catechism, and to play an instrument. Older boys learned tailoring, shoemaking, carving, carpentry, blacksmith, stone cutting, and brick laying (Bennett 1926). The girls were taught to spin and sew (Bennett 1926). In 1680 there was a rebellion that closed the school in New Mexico, and the Franciscan School established new schools in Texas (Bennett 1926). But, concepts stayed the same; girls learned house-chores, and boys learned their way around the shop and about agriculture.

In 1642, Massachusetts passed an apprenticeship law (Bennett 1926). Massachusetts believe students should not be an apprentice if they are not able to read, understand principles of religion, and understand the laws of the country. Labor has always been a part of education whether it was done at school or at home. The reason for this was the belief that idle hands created sin. In 1647, Massachusetts also ordered, any town with more than fifty households to devote one house as a school to teach children (Bennett 1926). Both boys and girls went to school but were not taught the same topics. In early 1685, Thomas Budd's plan was to have schools for the rich or poor, boys, girls, and Indians with two hours in the morning for learning reading and writing, and two hours in the afternoon for learning the trade (Bennett 1926). The school would be free for all children (Bennett 1926). This was the last big change in technical education, until the American Revolution.

Between 1700 and 1775, there were no real changes in the industrial technology education curriculum in school (Bennett 1926). In 1778 a group called Moravians established themselves in Pennsylvania (Bennett 1926). The Moravians sent all boys at age twelve to live in a building where most of the single men lived. This was to help the boys to concentrate on their studies and they would be able to have a structure setting to learn. There the boys were taught trades in which they were interested. If a boy had no real interest in a particular trade, he was taught the trade of the elder men's choice. Girls had the same type of set up. They would be taught female arts. In 1787 in Maryland at Colesbury College, a skillful person would be hired to teach a type of gardening and carpentry classes (Bennett 1926). Also in 1787 an article was printed in the Columbian Magazine saying the school was to educate the children to country life, employ children to work the land, and to pay for their keep (Bennett 1926). In 1797, Dr. John dela Howe gave money to help twelve poor, orphaned children to go to school at Cokesbury College. They boys were to learn reading, writing, arithmetic, principles of geography, and geometry to be able to do practical surveying. The girls were to be taught brewing, baking, and other female arts until 1791, when Charles Willson Peale opened a drawing school that welcomed women (Bennett 1926).

By 1805, Philadelphia saw the opening of The Pennsylvania Academy of Fine Arts (Bennet1926). All through the 1800's fine arts institutes were opening; some were schools, while other were galleries (Bennett 1926). By 1814 there were many industry school ideas (Bennett 1926). A farm and trade school in Boston was started in a home owned by Sir William Phipps. As it grew, it was moved to Thompson's Island, where 157 acres in the Boston area became its new home.

In 1871 Hollis St. Church became the Whittling School (Bennett 1937). One room of the building was used to teach wood crafts or trade to 30 to 40 boys between the ages of twelve and sixteen. Three years later another industrial school opened and later united with Whittling School. As industrial schools were opening across the USA so were colleges. Schools got larger in size with more students attending. In October 1877, Professor C. M. Woodward's vision was to have shop work in the same educational plane as regular courses (Bennett 1937). He also believed that the school day should be increased from four to six hours of shop work and three to four hours of grammar school (Bennett 1937). The 1881's brought more manual training schools or working men's schools along with the first wood's textbook. A detailed guide was developed for each manipulation performed in a basic wood shop (Bennett 1937). Other schools across the US were experimenting with offering industrial courses at the regular school during the school day. In 1884 the National Education Association (NEA) started having student exhibits at some of their conventions (Bennett 1937). In 1884 Baltimore had the first public manual training high school within a public school system (Bennett 1937). Also, in 1884 the International Education Association (IEA) was organized (Bennett 1937). The IEA wanted to arouse public interest in industrial education, so they held a children's industrial exhibit; more than sixty schools were represented. The excitement the exhibit brought helped the industrial education programs grow and expand. More books were published in 1887 for the industrial education field (Bennett 1937). Gustaf Larsson in 1880 was very interested in the mechanical drawing occurring in the public schools (Bennett 1937). He got involved in the schools by teaching a mechanical drafting class in Boston and wrote a book about working drawings.

In 1893, the city of Boston sent exhibits from three schools to Chicago to the Columbian Exposition (Bennett 1937). The attention received by the exhibits was enormous. In the next few years, there was an increase in the number of schools starting manual training. Other important changes made in 1898 were to enhance manual training courses, have complete fusion with regular high schools, and have richer curriculum on the technical side (Bennett 1937). The term manual training used since 1876 was changed to manual arts in 1894 (Bennett 1937). In 1899 during an American Society of Mechanical Engineers meeting, it was brought up that the demands have increased, but the education has stayed the same (Bennett 1937). Milton P. Higgins believed the common schools were not giving adequate training. This organization developed a plan to work with the common schools to help close the gap. At his schools, John Dewey placed industrial occupations at the center in elementary school curriculum in 1899 (Bennett 1937). Dewey wanted school life to blend with real life. The name manual training/arts were suggested to be changed to Industrial Arts in 1904 (Bennett 1937). The name change took a while to be accepted. From 1900 to 1910 many changes occurred, all directed to having industrial arts programs controlled by the public and offered through the elementary and high schools (Bennett 1937). This would eliminate groups like manufacturing companies from running schools. Specialty/Trade schools were used as an addition to the regular schools. A variety of experiments evolved or developed mostly during 1907 – 1917 (Bennett 1937).

In 1911, funding for vocational/industrial education was controlled by each state (Bennett 1937). Funding from the federal government was not granted to industrial education until 1917 (Bennett 1937). Before funding was available to the schools for industrial education, the public supported the programs. During WWI, Industrial Education contributed to the war efforts by training students with technical and mechanical skills. The schools kept their focus on automotives, machining, metal fabrication, forging, electrical, building, and drafting. There was an increase of shop work classes to include seventh and eighth graders in woods and metals. Schools made industrial education have a more practical effectiveness of instruction by relating it to the war.

By 1922, significant gains based on education value in the curriculum were made for shop work (Barlow 1967). William T. Bawden made efforts in 1923 to bring together shop teachers in order to create standards for industrial education classes (Barlow 1967). The standards would consist of suggestions what a student should be able to know after completing a certain activity.

Toward the end of the 1920's a growth in Industrial Arts was seen. Some of the sufficient advances in the 1920's were in curriculum changes, club activities, and girls being enrolled (Barlow 1967). Industrial education programs were finally accepted in1930 in general schools (Barlow 1967). Industrial Arts became a requirement at the junior high level. The 1930's showed few changes in the industrial education field, except those changes involving adjustments and revamping of the goals, standards, and curriculum.

In the 1940's, John F. Friese developed principles and a philosophy to help direct industrial education teachers (Barlow 1967). Industrial education was believed to be a necessary part in the education of children. Five major changes occurred in 1941 in the industrial education program characterized in Heber A. Sotzin has five distinct period: the Exercise period dealt with disciplinary values; Sloyd period articles were used to appeal to students interests; the arts and crafts period dealt with design and Artistic expression; an Industrial period in which was occupational training; and finally, the Industrial Arts period combined manual activities and occupational training (Barlow 1967). Louis V. Newkirk in 1946 identified objectives of industrial arts which directed the teachers and enabled them to achieve more with their students (Barlow 1967). After World War II, an expansion of industrial programs were made in high schools and colleges along with junior high schools (Barlow 1967). In 1947-1948, industrial arts was clearly identified as a bridge between secondary, vocational student programs to becoming skilled workers in occupations (Barlow 1967).

Working with apprenticeships helped the United States industrial growth become vogue in the 1950's (Barlow 1967). Partnerships formed by using advisory committees and working relationship with management and labor. A rebirth occurred in industrial education where research was forgotten and leadership development was born (Barlow

1967). With technological advancements came the need for skilled, trained workers, which was recognized with the Vocational Education Act of 1963. This Act was the foundation for helping students gain the needed training to meet employment requirements (Barlow 1967). The Vocational Education Act gave money for education in the vocational arts field. Industry and labor showed an interest in programs, and they supported schools in expanding the Industrial Technology program. The increased interest and need for skilled workers brought those changes into existence where standards were being developed and curriculum was being implemented by the states (Barlow 1967).

The 1970's brought great change to vocational education programs. Computers were starting to be incorporated into wood shops and drafting rooms. Standards and benchmarks were being redesigned and vocational education was still a "hands-on" class, mostly for boys, and basically the same as it was previously (Carson 2004). The major difference was that the equipment was better, and students were taught more technical information along with the use of computers and newer textbooks. What was still missing?

The 1980's brought a type of defined steps that teachers should use in the classroom. Educator Madeline Hunter had 6 steps that were to be included in the lesson plans of each lesson in order to assist teachers in teaching (Carson 2004). Madeline Hunter's steps include: Anticipatory Set, Input, Modeling, Check for Understanding, Guided Practice, Closure. She also has a step called Independent Practice used as needed or within one of the above mentioned steps. This, along with the consistent changes/modification of existing goals, standards, and benchmarks, were the main focus. Also in the 1980's, school to work programs began giving students a chance to work in a field in which they were interested (Carson, 2004). It helped the students find out if that job was really what they wanted after high school. These programs got the businesses involved with their local schools. Business and education partnership helped schools learn to adjust the curriculum to meet employer needs. As the programs expanded the need to redefine and rename the vocational areas became a priority.

By the 1990's the name was changed to Industrial Technology (IT). Changes made during this time were mostly making adjustments to curriculum and updating facilities. New classes were created to expand each sector of the IT fields. For example, modular or communication classes like TV or radio stations were added to the school curriculum (Carson 2004). More equipment was being bought to update the facilities along with more computer-based classes such as drafting, communication technology, and AutoCAD. The internet was integrated in classes for homework, projects, and research. Technology was growing rapidly.

Here it is the 21st century. The IT programs are still trying to meet the needs of business and make adjustments to their curriculum to meet state mandates such as No Child Left Behind Act (NCLB). Students are now required to be able to read, write, and understand technical information in the IT fields. The IT departments are now doing curriculum mapping, smart goals, team leadership activities, along with the everyday teaching scenarios. Advances in computer programs are made every year and require continuing education to maintain skills (Carson 2004). Teachers in the IT field are preparing students to work at an industrial/vocational job right out of high school.

Statement of the Problem

This study was to compare the Industrial Technology course offerings of computer aided drafting (CAD) courses at Maquoketa Community School District (MCSD) to the CAD courses offered at other high schools in the state of Iowa. The twenty school districts in Iowa which served as the basis for the study, are common in size and demographical area.

Purpose of the Study

This study's first step will be to examine the six state standards of CAD, using schools' course descriptions, prerequisites, coursework, and the recommended credits. Secondly, this study will show similarities and differences in CAD courses at MSCD that exist today with IT programs taught in the state of Iowa. Thirdly, it will make possible recommendations for the improvement of curriculum offerings for CAD students at MCSD.

Statement of Need/Justification

The need / justification for the study were based on the following factors:

a. Examination of CAD course offerings and curriculum at MCSD
b. Better utilization of state benchmarks at MCSD
c. Better preparation of students
d. Examination of the development in the curriculum of CAD

Limitations of the Study

This study will be conducted in view of the following limitations:

- restricted population of twenty public schools with 500 students or less

- only schools in a rural demographic area
- facility set up (number of computers available for the students)
- years of experience that each teacher has who is answering the survey
- grades 9 – 12 only

Definition of Terms

All definitions came from Neufeldt, Victoria (et al). (1994). *Webster's New World Dictionary* (3rd ed.). New York:New York.

Benchmark – a standard or point of reference in measuring or judging quality, value, etc.

Computer Aided Drafting (CAD) – a computer system used in combining design techniques and manufacturing principles

Demographic-population in regards to density and capacity in a particular area

Industrial Arts – mechanical and technical skills used in industry Industrial Technology (IT) – the science or study of the practical or industrial arts used in and need for industry

Manual Arts – skills or craftsmanship made or worked by the use of hands

Manual Training – training in practical arts and crafts

Maquoketa Community School District (MCSD) – the name of the school district this study is based on

Rural- related to country or country life

Standards – something established for use as a basis of comparison in content, measuring, and quality

Survey – examine for some specific purpose and review in detail

Vocational Arts- skills and crafts learned intended to prepare one for an occupation

CHAPTER II

REVIEW OF RELATED LITERATURE

Each individual has his/her own idea on how a CAD program should be operated. Some believe it is the environment that one is taught in that increases student achievement. Others think it is advancing technology in the program, and some believe it is a mixture of traditional and modern ways of teaching that will increase student achievement. No matter what one thinks, it boils down to curriculum. So if some believe the environment is a crucial part of the curriculum while others believe in something else, then who is right and who is wrong? Is it possible both are right? IT professionals have looked into this and how it affects CAD students. Here is what has been found by a few of those professionals.

A. Kapur (1995) designed the basics for an efficient CAD lab in universities and assists others in different levels of education to set up labs in their facilities. The suggestions by Kapur (1995) were to help increase student learning environment. Kapur believes the first step to setting up a CAD lab is to start by keeping a journal. The journal is to record day-to-day activities, such as purchase orders and phone messages from vendors and suppliers. The lab should contain what is needed to improve the curriculum and student learning. This includes bookshelves, reference books, textbooks, etc. It is also a good idea to have a mini library with journal articles and magazines to increase resources for the teacher and students. Kapur (1995) also suggested using two bulletin boards: one for announcements and the other for information for each course. This way information will be more organized and easily read by all.

Once a journal is started, teaching aids are a must. Models and practical hands-on examples are needed to improve the students' study. The models and hands on examples need to be stored either in an easy to access closet, adjoining room, or use as some of the décor of the room. It is also recommended to have a white board because they are easier to see and multiple colors may be used; this helps the teacher teach, and students learn with clearer notes and examples.

Besides teaching aids the physical environment is also important. Once the workstations are operating there will be a noise factor. Having acoustic ceilings and carpeted floors will reduce noise level. If static from the carpet is a concern, one could use tiles. The server should be located in a different room; this will help with the noise level. Student desks should be in close proximity to the computer system and writing space. Surfaces should be durable, light in color, and smooth. Chairs with back support, and roller castors are what Kapur suggest. This author believes enhancing the surroundings is a necessary item to improve in order to increase learning and enhance CAD curriculum.

H. Begler, 1998, highly believes that it is important to teach traditional drafting prior to beginning with CAD to enhance CAD curriculum. Begler says there are certain drafting terms that are best learned using traditional methods. The reason is that students are not able to grasp the concepts by using CAD only. The board drafting teaches the concepts needed in order to understand the CAD program with drafting concepts. The student who knows and understands both the traditional way and the computer way are more employable. Some members of the teaching profession disagree with this. Some believe there is no need to learn board drafting first, they feel just jump into the program learn drafting specifications and the program at once.

Year after year Begler, 1998, continues to hear complaints from employers that instructors need to teach their workers how to measure. Manual drafting uses precise measuring. Those students who struggle with measuring to the nearest one-sixteenth of an inch do not have the job entry skills that are needed. Lettering is also a needed skill. Manually lettering teaches neatness and work ethic. Lettering requires concentration and is hoped to carry over to other areas of a student's life.

A drafting teacher interviewed by Begler has also heard negative remarks from employers in the lack of problem-solving skills. Traditional drafting incorporates problem-solving skills within assignments. Students who take board drafting use the following skills: math, geometry, accurate measuring, and visualization techniques. Students must present a neat, concise finished product. Learning drafting is a slow step-by-step process. If a step is skipped or one goes too fast, the concept is not completely grasped.

Begler believes drafting programs at the high school level should begin with the traditional board technique, and students should master that before being introduced to CAD. Also, teachers should teach the students well enough to allow them to succeed anywhere in the workplace. In doing this, students will have a strong traditional foundation with CAD expertise.

M.E. Rogers, 2004, believes using more computer curriculum as an interactive hand on activity is the way to go. Rogers believe this will increase the possibilities for a CAD program. Teachers will need less time to prepare and less behavior problems will result with students. Rogers, 2004, did find that students achieve higher test scores in traditional drafting class, but students can learn more and in a faster amount of time the computer way. Roger, 2004, believes this will be more helpful to the students than it is to master a few topics the traditional way.

Rogers, 2004, has some recommendations from his study of comparing the two methods and they are as follows: a) more research done in this area b) use a larger study group c) have a more gender balanced environment and d) increase instruction time for both groups. Besides this, he also believes it is necessary to have more data to help school districts to support spending in a more computer based program/curriculum.

Author L. Rannels, 1998, did a study on CAD solid geometry/modeling using a CAD program. Rannels believe students have more computer knowledge today than in the past. This makes students have less 3-D cognitive ability. Computer aided drafting systems are used to draw geometric shapes which the terms used in CAD are found in a geometry text. Students seem to pick up how to operate a CAD program quickly. After drawing the geometric shape, it can be printed immediately and then assembled. Students are able to better analyze and understand the relationship of geometric shapes. The print out of the geometric shape gives the students practice on measuring skills, protractor skills, and figuring surface area for precision. Once the geometric shape is assembled students could test and prove volume calculations. The print out may also be used as a pattern, in order to make a geometry shape out of another material. Students are able to learn skills to help them in the marketplace.

Construct and manufacture activities use simple and complex geometric shapes. Students also learn communication skills, abstract theory, hands-on learning, and problem solving. Rannels believes teaching this in the middle school level will help students think in 3-D and gain academic success. These days' computers are used in almost everything people do. Today classrooms of every kind use computers as a tool to teach. Rannels feels the best place to learn, analyze, and experience application is by using CAD in the classroom.

Rannels, 1998, also see a benefit of using CAD in that students are able to do "real world" applications. Another benefit is students learn theories and concepts of geometry. Students receive computer-based communication skills and solid geometric applications for the workforce. Rannels believes using computer technology skills are less important and the ability to memorize knowledge more important. In a CAD class, geometry is focused on computer technology in learning and the application of geometric shapes. Rannels believes CAD should be incorporated in the high school curriculum in more than one area. He sees this as a great benefit for students in learning solid geometry with clear vision of the applications used in the real world.

Technical drawings used for centuries to communicate ideas are an important part of technology programs today. S.D. Mackenzie and D.G. Jansen believe the primary goal in this area is to develop knowledge and skill of students in the drafting field. The author believes the traditional tools for drafting are limited and are unclear in difficulty and complex concepts. The authors find the major limitations are a) presenting 3-D in a 2-D format and b) the time to present the information on a chalkboard.

Computers have increased in the drafting area. Education programs are going towards two basic models of multimedia computer based instructions (MCBI). So Mackenzie and Jansen did a study comparing a group with commercial multimedia package. The media package was loaded on computers (MCBI-1) or a network and one group using interactive multimedia instructional device (MCBI-2). The controlled pace and sequence of information is given by the instructor throughout the course.

The purpose of Mackenzie and Jansen's study was to 1) examine effectiveness of MCBI-2 through quantitative analysis, 2) explore students' attitudes toward using MCBI-2 in the classroom and 3) conduct a cost benefit analysis. They started with the idea of finding a level-1 technology graphic software package. Mackenzie and Jansen found four different packages. They found the packages are limited in scope and does not cover design/drafting material well enough to be useful. These packages are good for pre-MCBI and one on the computer based training. The authors also believe incorporating 3-D computer graphic concepts would help students to better understand. Due to the lack of documentation on effectiveness of the MCBI-2 model, there needs to be a test created in order to decide whether MCBI-2 is adequate.

The authors used both quantitative and qualitative research methods in order for them to have a complete understanding of their study. This helped them have a balanced assessment. They targeted students of technology graphics programs for this study. They used a nonequivalent control group design. Using a nonrandomized treatment and control group makes it a quasi-experimental design.

Mackenize and Jansen found benefits using the media based approach. Their study indicates the MCBI would improve teaching technology graphics. Students are more captured with the MCBI which helps students to maintain attention. Another advantage they found was the ability for students to go back and review information from the lesson. Also, using MCBI software helps instructors stay current with computer applications.

The presentation of material for both formats, MCBI-2 and traditional instructions, were found to be equal by Mackenize and Jansen. The media base required longer set up time and equipment shared by other instructors, so one must figure an extra twenty minutes. MCBI-2 is more attractive to instructors and students because of the more computer applications. To create/design an effective computer based presentation is time consuming. To have a good program involving media base learning research is needed. Being a prepared and knowledgeable teacher will increase student learning.

Mackenzie and Jansen came up with some recommendations to assist faculty and teacher educators. They think administrators need to help the educator explore ways to increase student interest and enhancing learning. New teaching strategies need to be encouraged. Teachers need to be able to keep abreast of new techniques and models as they come out. This will help keep the educator more effective and efficient in his/her classroom. Continuing education is always an important way to help the educators and in turn help the students. Teacher in-services are one way to increase educators' training. Instructors need to read and have time to look at other programs and material. Material on CD's is a good tool to use as part of instruction and student reference material. Lastly, having a lab that is fully equipped to decrease set up time, provide fast feedback, projects on projections screen, adequate lighting, and of course good communication between teacher and students. Looking at items like learning environment, traditional verses modern drafting, geometric and solid shape modeling, or multimedia package will help other teachers improve their program. All this affects the curriculum and how the students learn.

Questions to be Answered

Using questions related to previous writers are identified and utilized below:

1. At what grade levels are the CAD course(s) offered to students?
2. Are CAD classes offered each trimester, quarter, semester, or yearly?
3. How many students are enrolled in each class?
4. What is the maximun number of students enrolled in CAD class?
5. What CAD software is used?
6. What is the description given for CAD courses in the student handbook?
7. What are the prerequisites?
8. How many credits are given for the CAD course(s)?
9. How do students demonstrate the knowledge of creating two-dimensional and three-dimensional scale drawings?
10. How are teachers using the CAD software programs to have students create two and three dimensional objects?
11. How many drawings do the students use to create sectional and pictorial drawings with the CAD software?
12. Do students create a working drawing using CAD software? If yes, what are the objects they create?

CHAPTER III

METHODS / PROCEDURE / RESEARCH DESIGN

This study is a descriptive research design, by taking Maquoketa High School's demographic makeup, comparing them with the population and demographic area of other high schools in the state of Iowa. Next, the number of schools was limited to twenty high schools with the same or similar enrollment size and demographic area as of MCSD were used for comparison. Each teacher questioned was asked to participate (Appendix B, pg 36) through their principal (Appendix A, pg 33). Information was gathered by a survey, that was mailed to the participate (Appendix C, pg 38-41). Each school was asked to provide prerequisites on CAD course(s) and explain how they used or showed proficiency of students, according to the state standards. The descriptions will be used to check for accuracy and consistency along with course similarities.

This study will use information that is gathered by survey method to see what is being offered and to determine any trends across the state of Iowa. The information will help the MCSD IT departments make better decisions on which CAD course(s) should be offered and implement any possible changes to the IT program.

To help each school respond to the survey, I sent a letter asking them to help (Appendix A, pg 34) with a returned stamped envelope to each school that agreed to participate in the survey in order to return requested items. The response rate for the returns was 50 % returned the survey. Reminder calls were made through a six week time line in order to encourage every participant to respond to the survey and send back their results. The reminder calls only increased the return rate by 3% more.

Research Activity Schedule

Rough Draft of Proposal: July 1, 2005

Final Draft of Proposal: September 25, 2005

Asking Approval from Schools: September 20, 2005

Schools Approval Response: September 26, 2005

Send Surveys: October 1, 2005

Reminder Calls: October 11, 2005

Second Round of Reminder Calls (if needed): October 21, 2005

Third Round of Reminder Calls (if needed): October 28, 2005

Review the Collected Data: when all items are in or November 5, 2005 at the latest

Rough Draft of Paper: November 25, 2005

Final Draft of Paper: May 1, 2006

Thank you Letters to each Participating School and Teacher along with a copy of the paper: May 1, 2006

CHAPTER IV

FINDINGS

Twenty schools were asked to participate; permission was given from fourteen schools to send the survey out to their instructors. There was 79% rate of returned permission to send survey out. There was only 70% of participation rate of teachers who participated in the survey. Teaching experience rated at 60% of those surveyed had six to ten years of experience. There were 30% who had five years of less teaching experience and only 10% who had more than eleven to twenty years experience (Appendix D, pg 58). MCSD teacher has 8 years of experience.

The survey results indicated the majority 60% of students being taught CAD were juniors, 30% and 30% were seniors. There were 24% sophomores and 16% freshman being taught CAD (Appendix D, pg 43). Question two indicates the class length being a semester long with the majority response of 64%. CAD being taught for a quarter or year long were both at 18% (Appendix D, pg 44). This is comparable to MCSD. Most students are juniors, class length is a semester long, student's receive one credit per semester. According to those that I surveyed 64% of students were given one credit per semester. Only 36% of students receive half credit (Appendix D, pg 45).

Most schools had an average class size range between ten and fifteen students with 42% according to answers from question four. Other class size percentages were 17% of five to ten, 33% for class size of fifteen to twenty, and 8% for class size of twenty to twenty five. None of the schools surveyed indicated they had more than twenty five students (Appendix D, pg 46). MCSD had an average of 12 students in CAD classes. As for textbook usage 58% of the schools did not use one and 42% did use a textbook

(Appendix D, pg 47). Those who used a textbook used it throughout the week, 27% used a textbook one to two times a week, 18% used one three to four times a week, 27% used it daily, and 9% used it biweekly with 1% never used one (Appendix D, pg 48). MCSD uses a textbook daily as for reference in drafting information and assignments are taken out of the books. The majority 60% had no website support from the textbook used (Appendix D, pg 50).

All the schools that were surveyed had 1:1 ratio of students per computers (Appendix D, pg 52). This is also what MCSD has a 1:1 ratio of students per computers. This would also support the number of CAD stations in their IT department would be as follows; 0% at zero to five, 9% six to ten, 18% of eleven to fifteen, 36% sixteen to twenty, and 36% of twenty-one or more (Appendix D, pg 51). The CAD program used AutoCAD mostly at 46% of those surveyed (Appendix D, pg 49). Version of CAD editions were used AutoCAD 2006, Auto-desk 2006, Auto-CAD 2000 LT, Auto-CAD LT 2005, and mechanical desktop 2002. Solid works was used by 18% of who was surveyed (Appendix D, pg 49). MSCD used Auto CAD only with 2000 edition. Everyone used CAD with one or more classes taught. Looking at appendix D, page 55, shows CAD being used 31% in mechanical, 31% in architecture, the most. Technical drafting had 7%, CAD only class 28%, with a 3% in other category (Appendix D, pg 55). All schools used CAD to create most types of drawings, which breaks down to 15% mechanical drawing, 15% two-dimensional drawings, 17% three-dimensional drawing, 15% sectional drawings, 14% pictorial drawings, 17% working drawings, and a 6% for the category of other (Appendix D, pg 56). As for MCSD, they used CAD for all types of drawings listed above. Several drawings are being created on CAD to achieve student understanding. The number of assignments assigned and done with CAD is as follows; Multiview 65 assigned with 75% done on CAD, Two-Dimensional 92 were assigned with 100% of those done on CAD, Three-Dimensional had 52 assigned with 100% done on CAD, Sectional drawings 21 assigned with 20% on CAD, Pictorial drawings 32 assigned with 75% on CAD, and other drawings 11 assigned 50% done on CAD (Appendix D, pg 57). MSCD used each type listed above in their CAD classes. All assignments assigned would be done on CAD.

Question twelve asked if there was an overhead projector used or one available to use. The results are 60% said they don't use it and 62% indicate they have one available (Appendix D, pg 53). The overhead projector was used one to two times a week for 60% of those surveyed and 40% used it three to four times a week. No one used it on a daily basis (Appendix D, pg 53). MCSD had one available, but was never used. As for the type of strategies used individual ranked highest with 48%, instructor came in second with 43% and contract and modular tied with 4% each (Appendix D, pg 54). MCSD used a combination of individual and instructor at all times.

CHAPTER V

CONCLUSION

As we looked at all the different items in this paper it can be summed up as "always improving." Each teacher who participated is consistently looking for things in their curriculum that needs to be improved. By doing this paper it is helping each of us to make necessary changes in our curriculums to improve what we can offer to the students. It is helpful to know what other schools are doing and with the busy schedule a teacher has it is hard to do research on it. This paper will, I hope, be a tool or reference to those who care to use it to increase their curriculum.

Majority uses CAD quiet frequently for one or more classes with very little done the traditional drafting way. MCSD uses both ways CAD and the traditional drafting. Students start out on the board for one year gathering and mastery drafting techniques and skills. Then students have an opportunity to a CAD class. This is where the student took what they learn and incorporate it into CAD drawings. Students pickup on CAD faster with teaching it this way in my opinion. After taking CAD, students have opportunity to take architecture drafting on CAD. As the costs of things raising for schools it is causing the schools to down size staff and programs or revamping and reorganized what they teach. After studying and analyzing the results of the survey it has come to me that the traditionally drafting class has faded. This of course increases CAD use and enhancing the amount of items earned in the class. Students are able to earn more which in turn helps them in their future.

CHAPTER VI

RECOMMENDATIONS

The findings created two recommendations to offer to the MCSD 1) the traditional drafting to be reduced or end all together 2) increasing the CAD curriculum to include more pictorial, working drawing, and solid modeling for CAD class. The findings from survey information will be shown as bar charts in appendix D to show the reason for these recommendations. I would also recommend the study be looked at from other areas of the CAD field. Along with possibly replicating the survey to see if the same results are found. Another recommendation would be to deepen the survey in order to find more details on the schools curriculum and CAD courses offered.

REFERNCES

Barlow, Melvin L. (1967). *History of Industrial Education in the United States.* Peoria, IL.:Chas. A. Benett Co., Inc.

Begler, H. (1998, April). Training drafting students traditional as a precursor to computer aided drafting. [Electronic version]. *Tech Directions*, 57 (9), p33, 1p.

Bennett, Charles A. (1926). *History of Manual and Industrial Education Up to 1870*. Peoria, IL.:Chas. A. Benett Co., Inc.

Bennett, Charles A. (1937). *History of Manual and Industrial Education 1870-1917.* Peoria, IL.:Chas. A. Benett Co., Inc.

Card, Boyd A. (1999). *Curriculum of the Dubuque Community School District in Relation to Industrial Technology Programs in the State of Iowa.* Cedar Falls: University of Northern Iowa, Industrial Technology Department.

Carson, Deb (personal communication, October 10, 2004).

Gutek, Gerald L. (2000). *American Education 1945 –2000 A History and Commentary.* Prospect Heights, IL.:Waveland Press, Inc.

Kapur, A. (1995, April). Computer aided drafting lab planning. [Electronic version]. *Tech Directions*, 54 (9), p54, 2p, 3bw.

Mackenzie, S.D. and Jansen, D.G. (1998, Summer). Impact of multimedia computer-based instruction on student comprehension of drafting principles [Electronic version]. *Journal of Industrial Teacher Education*, 35(4), p.61-82.

Neufeldt, Victoria (et al). (1994). *Webster's New World Dictionary* (3rd ed.). New York: New York.

Rannels, L. (1998, January). CAD solid geometry/modeling class it is time to rethink how we teach solid geometry? [Electronic version]. *NASSP Bulletin*, 82, p 117-119.

Rogers, M.E. (2004, Summer). A comparison of the effectiveness of modular drafting instruction versus contemporary drafting instruction on collegiate technology education student. [Electronic version]. *Journal of Industrial Technology Education*, 41 (2), p 37.

APPENDIX A

Letter to Principals

Their Name
Their School
Their Address

Dear Principal,

I am an Industrial Technology Teacher of nine years and currently an University of Northern Iowa graduate student working on an Industrial Technology Education Master's Degree. In completing my degree, I need to write a research paper. I would like to survey your Industrial Technology Department to compare information with the Maquoketa Community School District Industrial Technology Department. I would like your permission to send a brief questionnaire to your Industrial Technology instructor who teaches CAD course(s). All responses will be kept confidential.

I would greatly appreciate your department's assistance. A copy of the results will be sent to your Industrial Technology Department. Please call or send your response in the self-stamped envelopment enclosed. Thank you for your time.

Sincerely,

Rhonda Welford
Ind. Tech. Instructor

Clinton, Iowa 52732

Date: ___________

Their School Name
Their Address

_____ I give permission to have Rhonda Welford to send a brief questionnaire to my

Industrial Technology teacher named, ___________________________ .

OR

_____ I don't care to have the Industrial Technology Department participate in Rhonda Welford's questionnaire.

APPENDIX B

Letter to Teachers

Their Name
Their School
Their Address

Dear Teacher,

I am an Industrial Technology Teacher and a graduate student at the University of Northern Iowa working on a Master's in Industrial Technology Education. In completing my degree, I need to write a research paper. I would like to compare the CAD curriculum of Maquoketa Community School District in relation to twenty other schools with the same or similar size and geographic area in the state of Iowa. I would greatly appreciate and will value your opinion on the enclosed questionnaire. The enclosed questionnaire is designed to obtain your views to improve the quality of Maquoketa Community School District CAD program. Your answers will be considered in writing my research paper and revisions in the Maquoketa Community School District CAD program in the coming year. I will also provide you with a copy of the results of my study.

I have enclosed a stamped, self-address envelope for you. I realize your schedule is busy and your time is valuable, but would like it if you could return this by October 10, 2005. This would help me in so many ways. All responses will be kept strictly confidential. I would like to thank you in advance for your cooperation.

Sincerely,

Rhonda Welford
Ind. Tech. Instructor

Clinton, Iowa 52732

APPENDIX C

Survey

Comparing Computer Aided Drafting Curriculum of Maquoketa Community School District in Relation to Twenty Other Schools' Computer Aided Drafting Programs in the State of Iowa

Descriptive Research Design

School:______________________________ Person Responding: ________________
Telephone Number: __________________ Email Address: ________________
Number of students in the IT program:______ Number of periods in a school day:_____

1. At what grade levels are CAD course(s) offered to students?

Freshman	Sophomore	Junior	Senior

2. Are CAD classes offered each trimester, semester, quarterly, or yearly?

Quarterly	Trimester	Semester	Yearly

3. Number of credits given per CAD course?
   Example: .5semester equal 1 semester work

half	
one	
one-half	
two	
other	

4. The average number of students enrolled in each CAD class?

five -nine	
ten-fifteen	
sixteen-twenty	
twentyone-twentyfive	
twenty five -higher	

5. Do you use a textbook?

yes		no	

6. How often do you use a textbook?

1-2 a week	
3-4 a week	
Daily	
Biweekly	
Monthly	
never	

7. What CAD software(s) do you use?
(Select all that apply)

CAD key	
Pro E	
AutoCAD	
Versa CAD	
other	

8. Is your textbook supported by a website?

yes		no	

9. What software edition do you have? ____________________

10. How many CAD stations do you have?

zero to five	
six to ten	
eleven to fifteen	
sixteen to twenty	
twenty one or more	

11. What is the student to computer ratio?

student /computer	
one to one	
two to one	
three to one	
other	

12. Is a overhead projection used ___________ or available ___________

13. If the overhead projection is used, how often?

once or twice a week	
three to four a week	
daily	

14. What type of strategies do you use?

instructor	
individual	
contract	
modular	

15. Is a type of CAD program used within the following classes?

mechanical	
technical	
architecture	
CAD	
other	

16. Is a CAD program used to draw the following type of drawings?

multiview drawings	
Two dimensional	
three dimensional	
sectional	
pictorial	
working drawings	
other	

17. How many assignments utilized the CAD programs in each of the following areas?

multiview drawings	
Two dimensional	
three dimensional	
sectional	
pictorial	
working drawings	
other	

18. How many years have you taught CAD classes?

0-5 years	
6-10 years	
11-20 years	
21-25 years	
26-30 years	
More than 30 years	

19. Please feel free to add anything else you would like in the space provided.

APPENDIX D

Charts / Finding Information

At what grade levels are CAD course(s) offered to students?

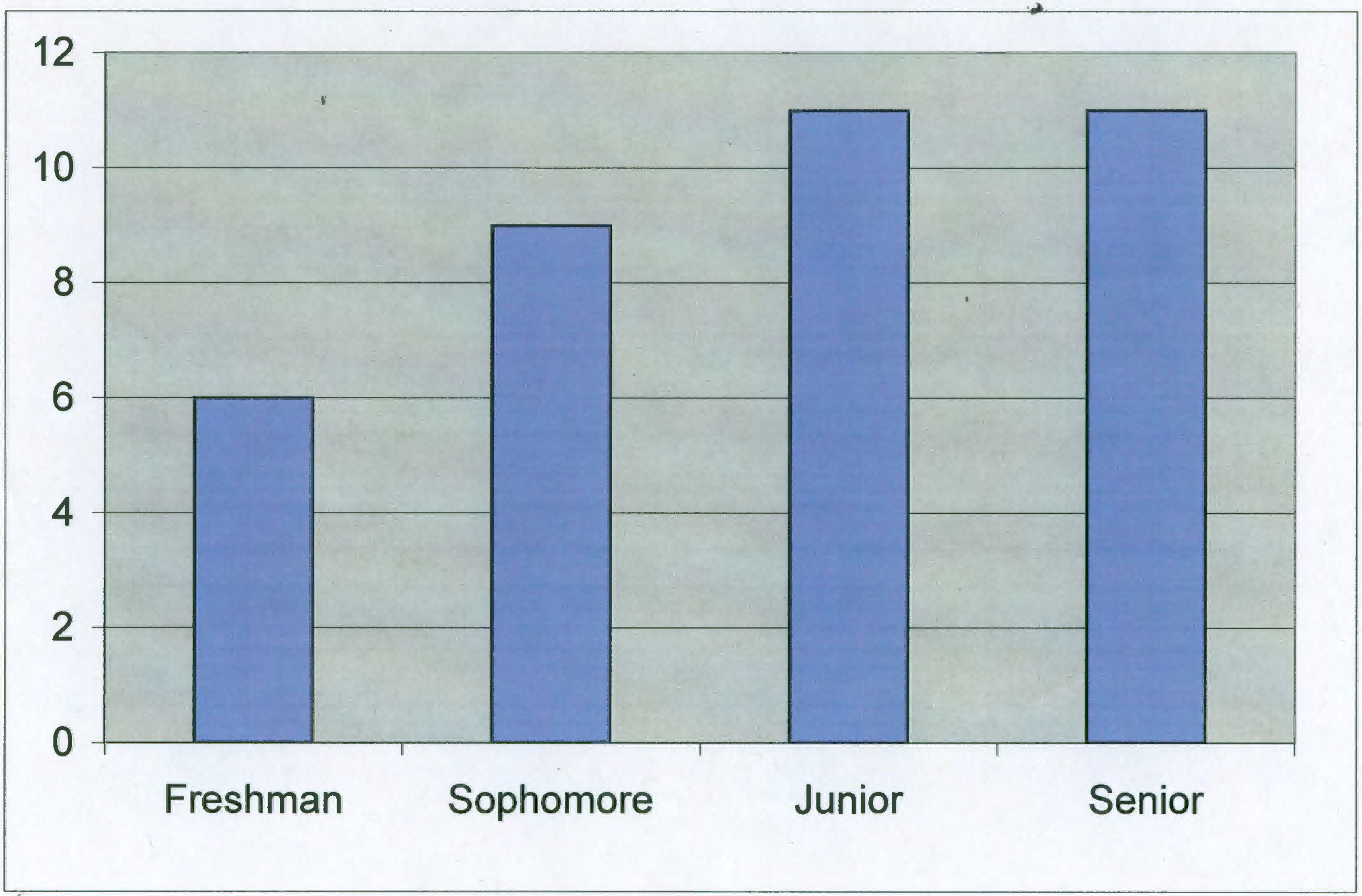

Figure 1

Are CAD classes offered each trimester, semester, quarterly, or yearly?

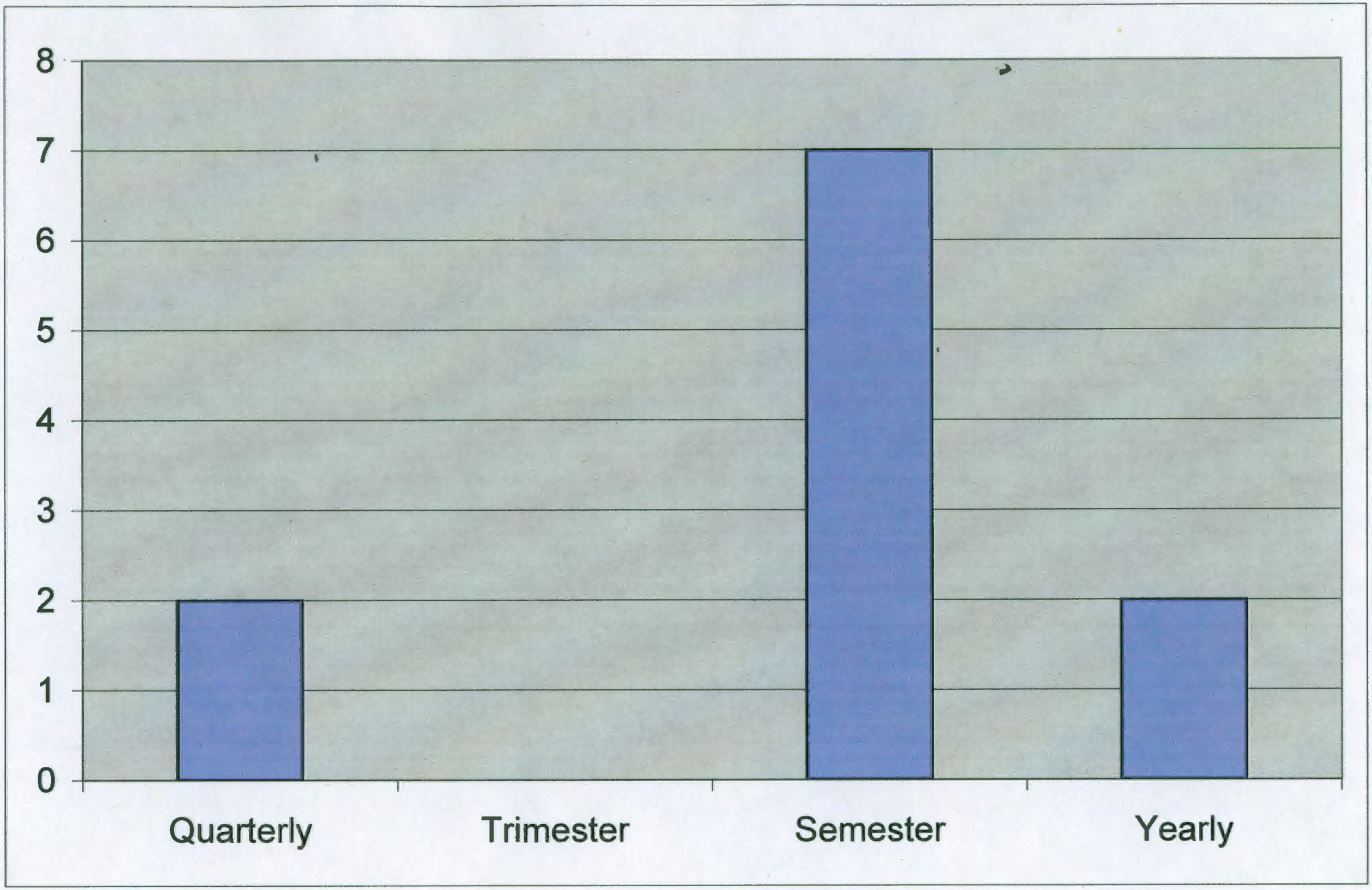

Figure 2

Number of credits given per CAD course?

Example: .5 semester equal 1 semester work

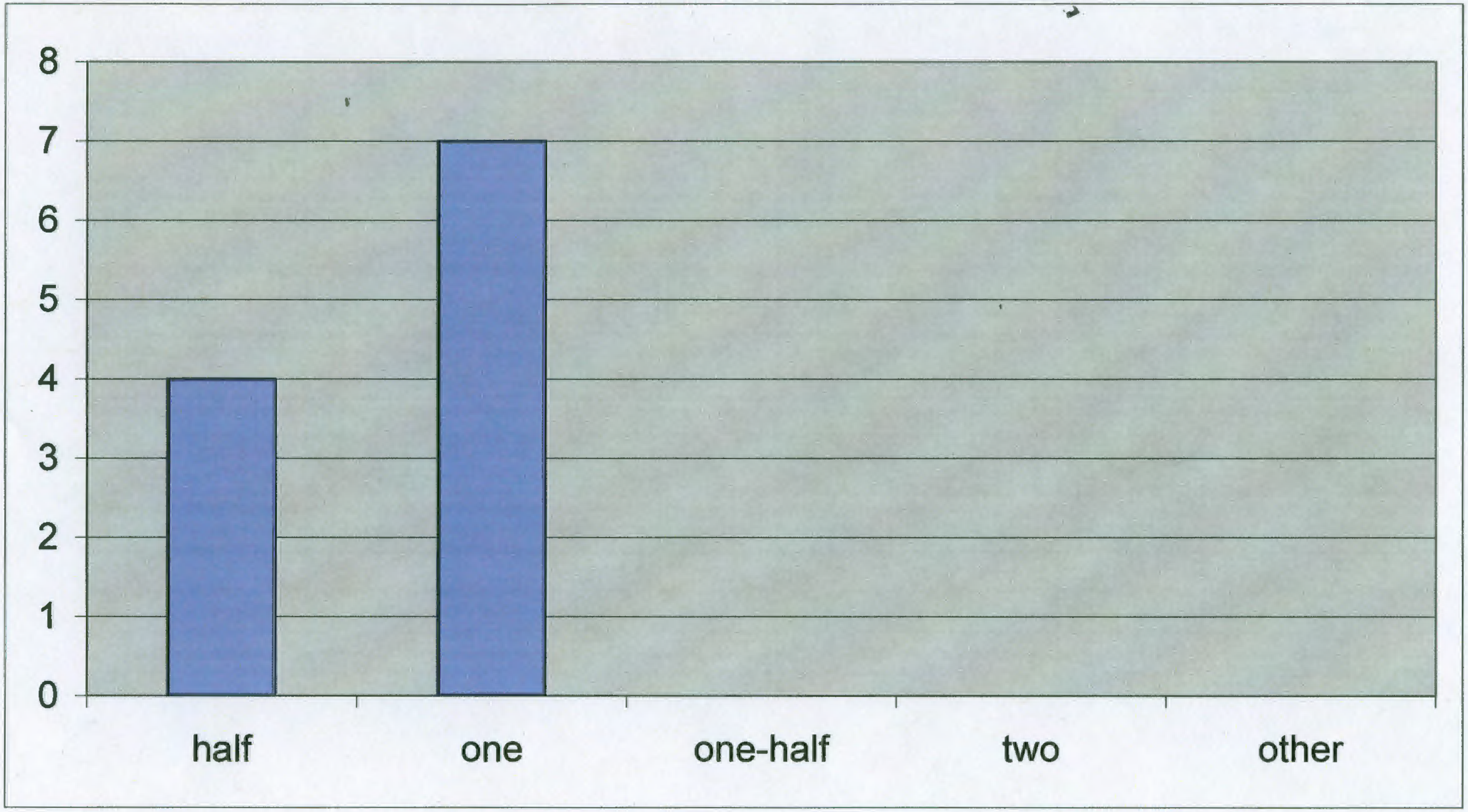

Figure 3

The average number of students enrolled in each CAD class?

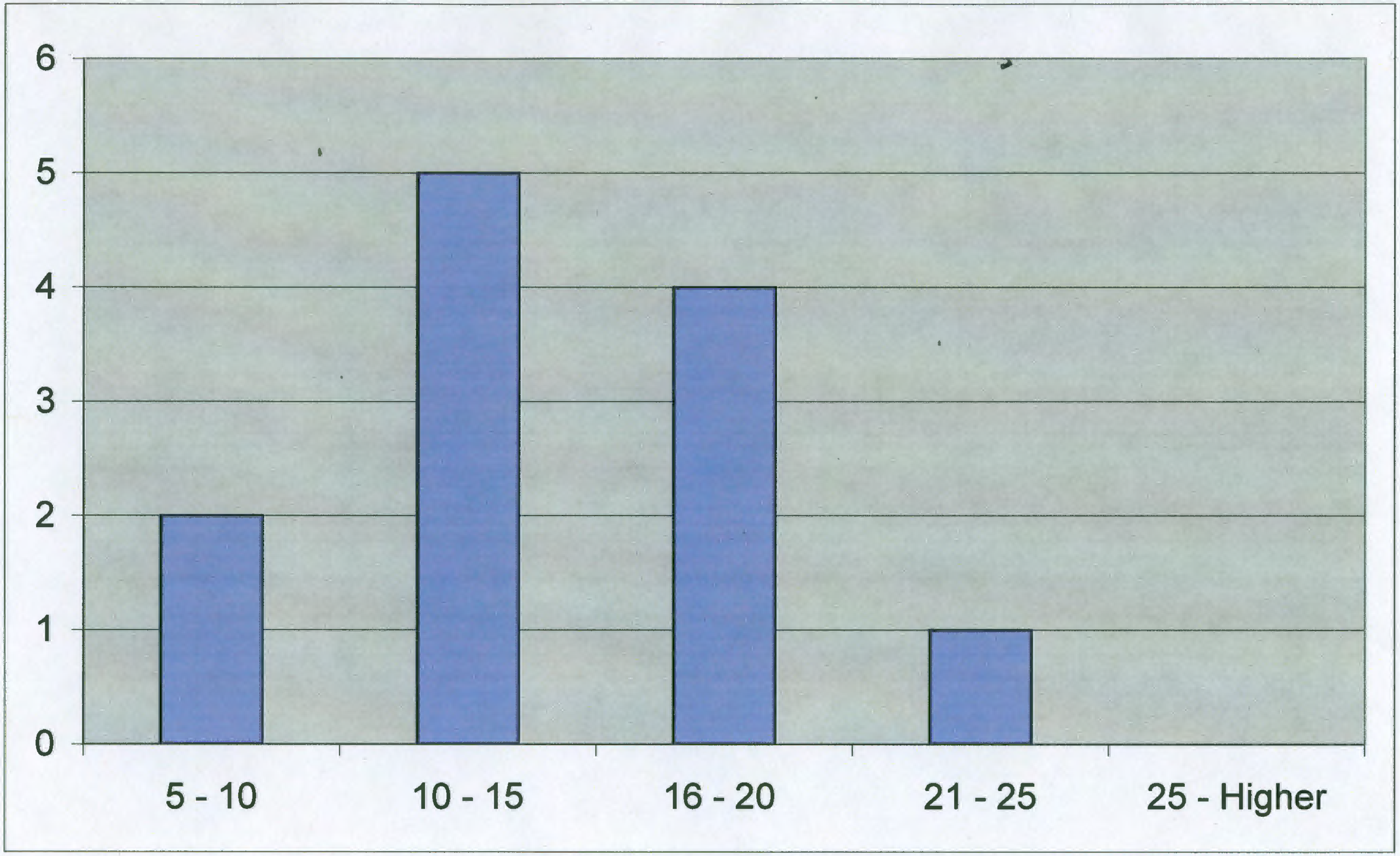

Figure 4

Do you use a textbook?

Figure 5

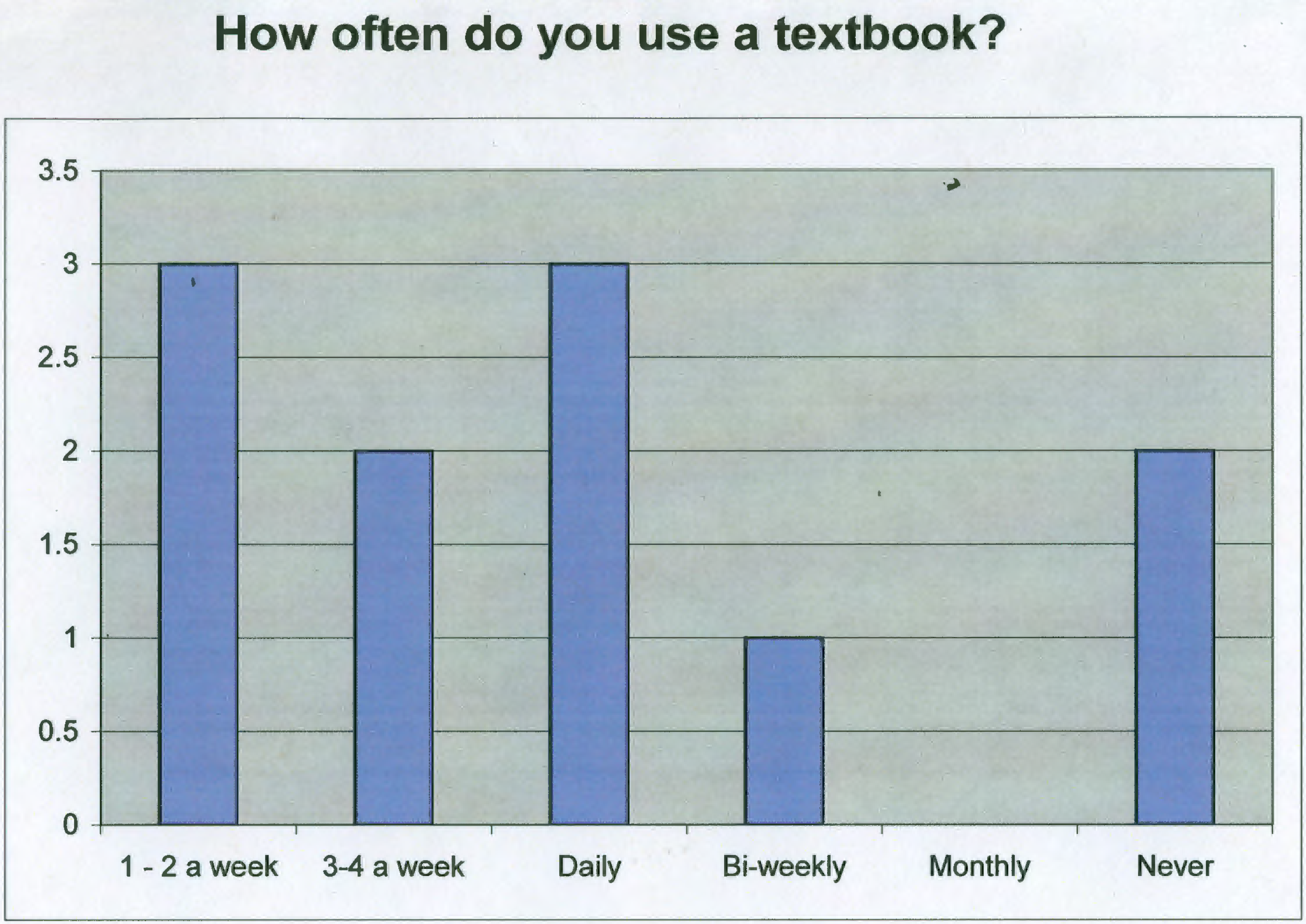
How often do you use a textbook?
3.5
3
2.5
2
1.5
1
0.5
0
1 - 2 a week
3-4 a week
Daily
Bi-weekly
Monthly
Never

Figure 6

What CAD sofware(s) do you use?

(Select all that apply.)

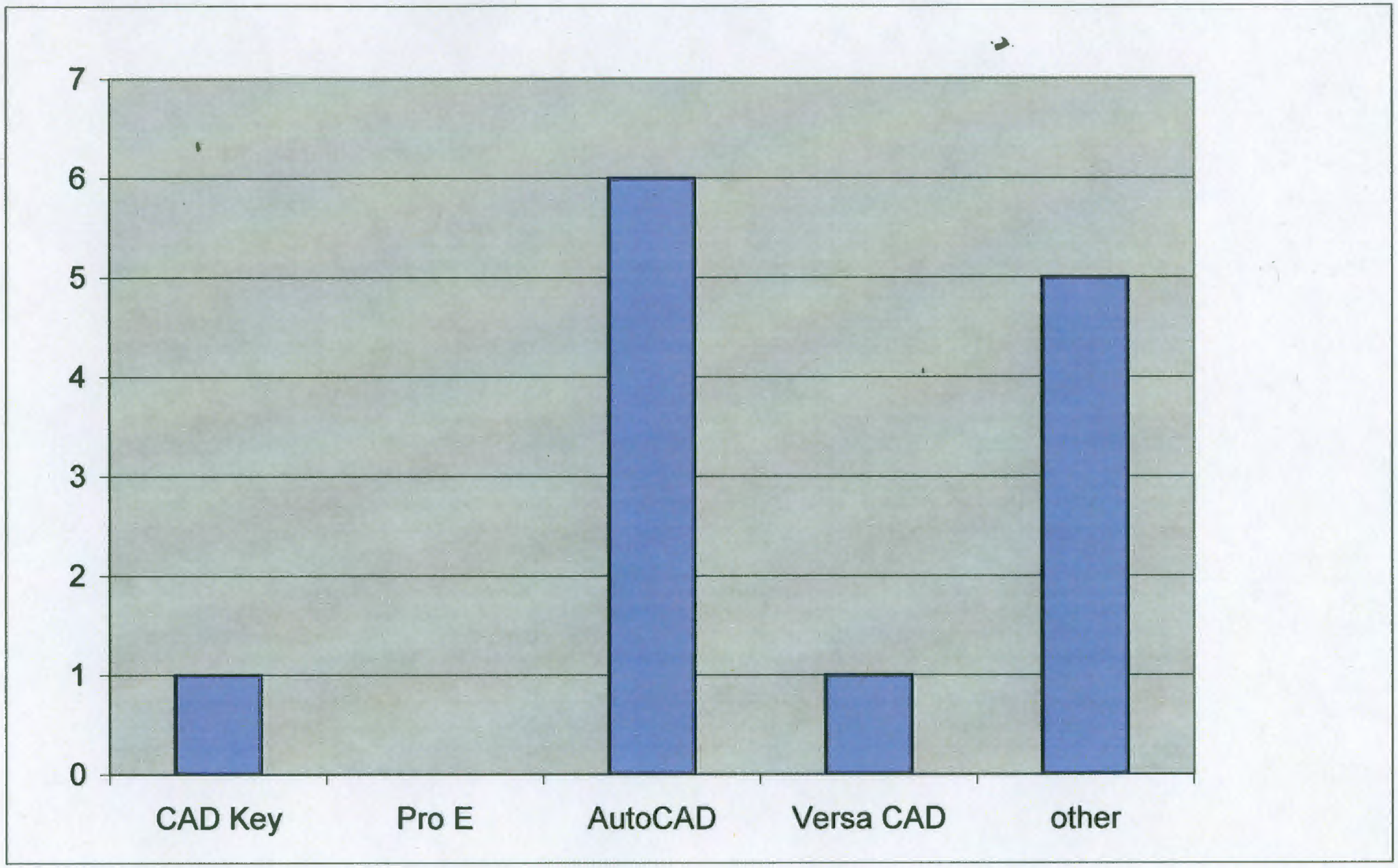

Figure 7

Is your textbook supported by a website?

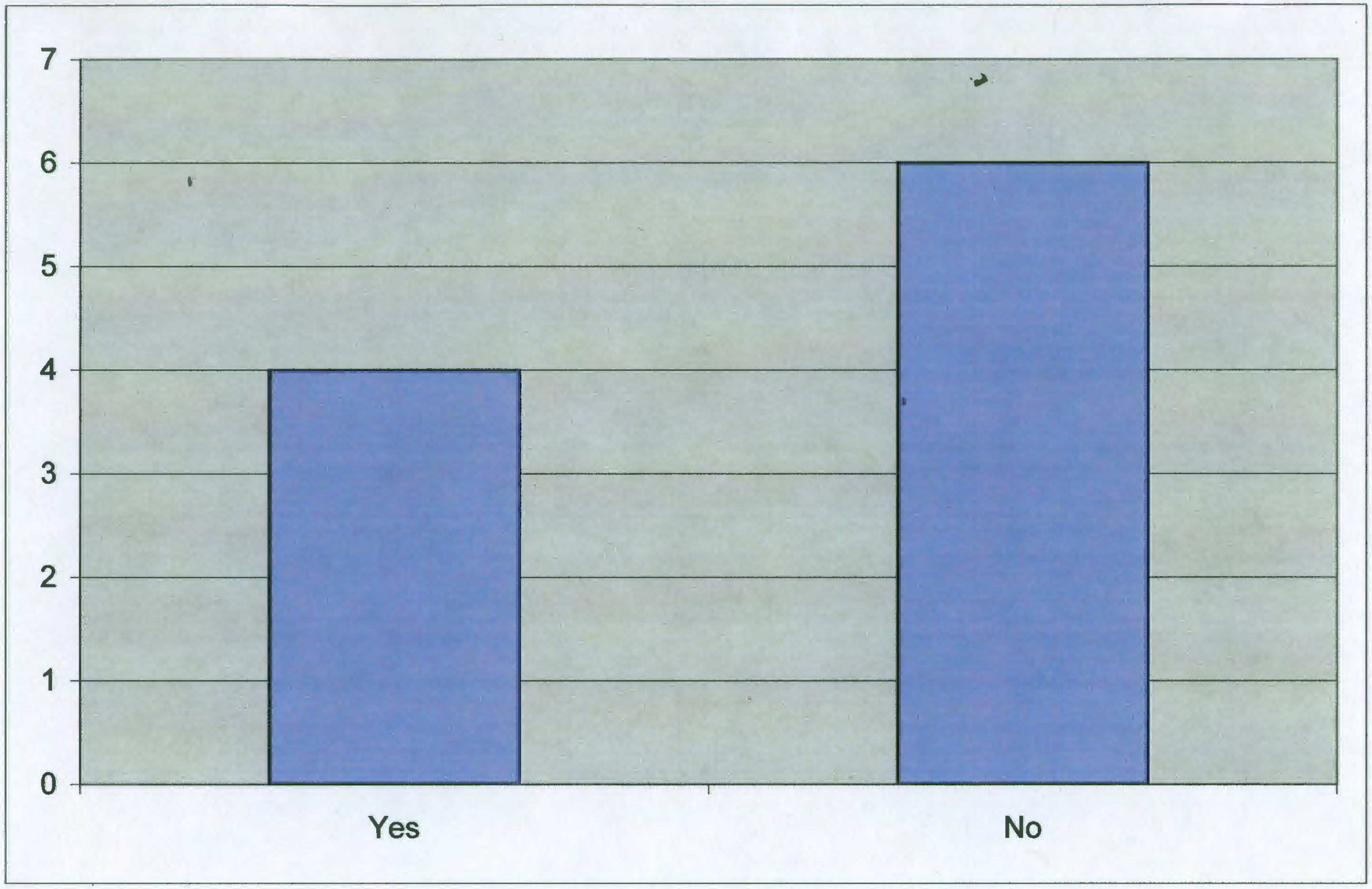

Figure 8

How many CAD stations do you have?

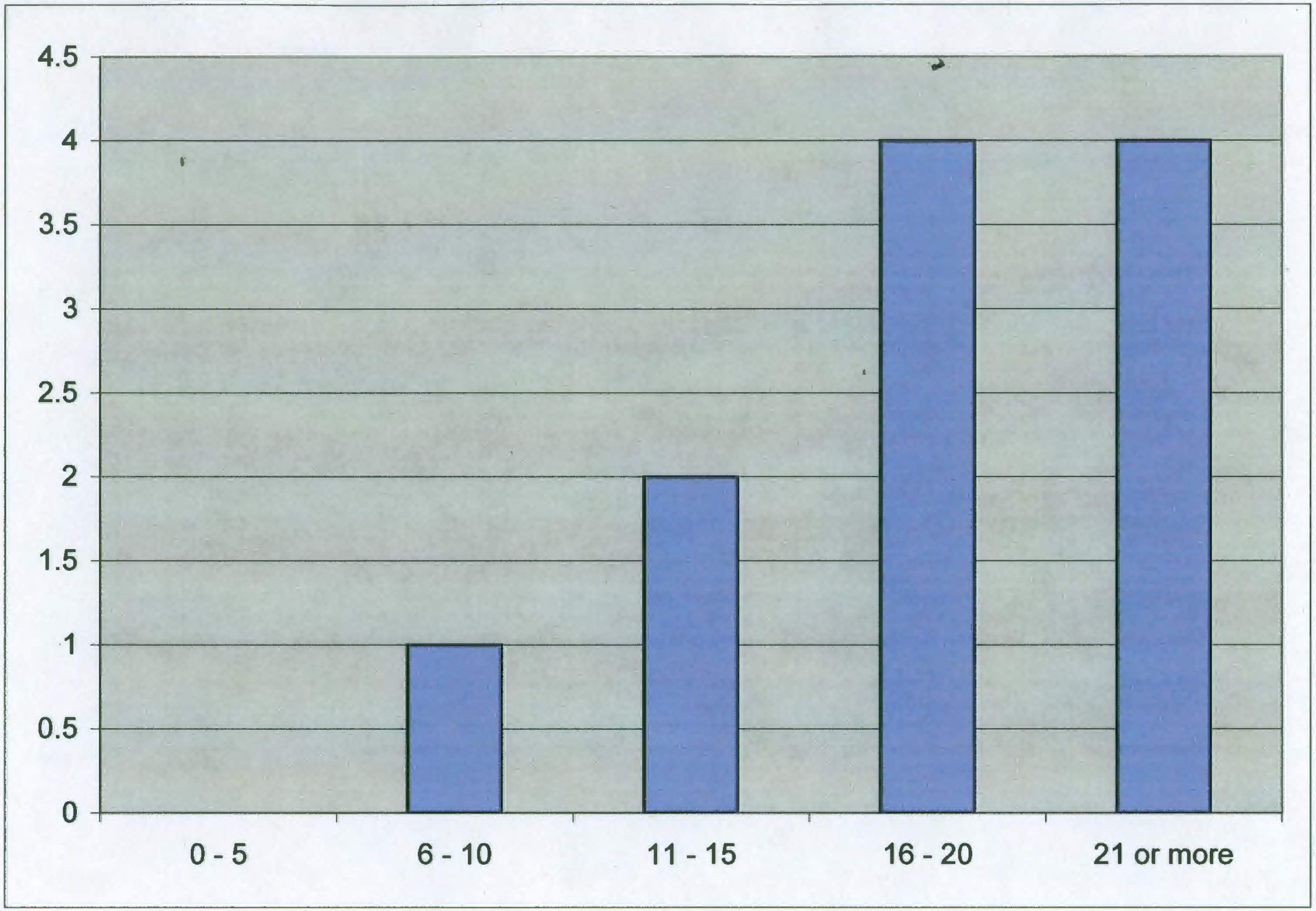

Figure 9

What is the student to computer ratio?

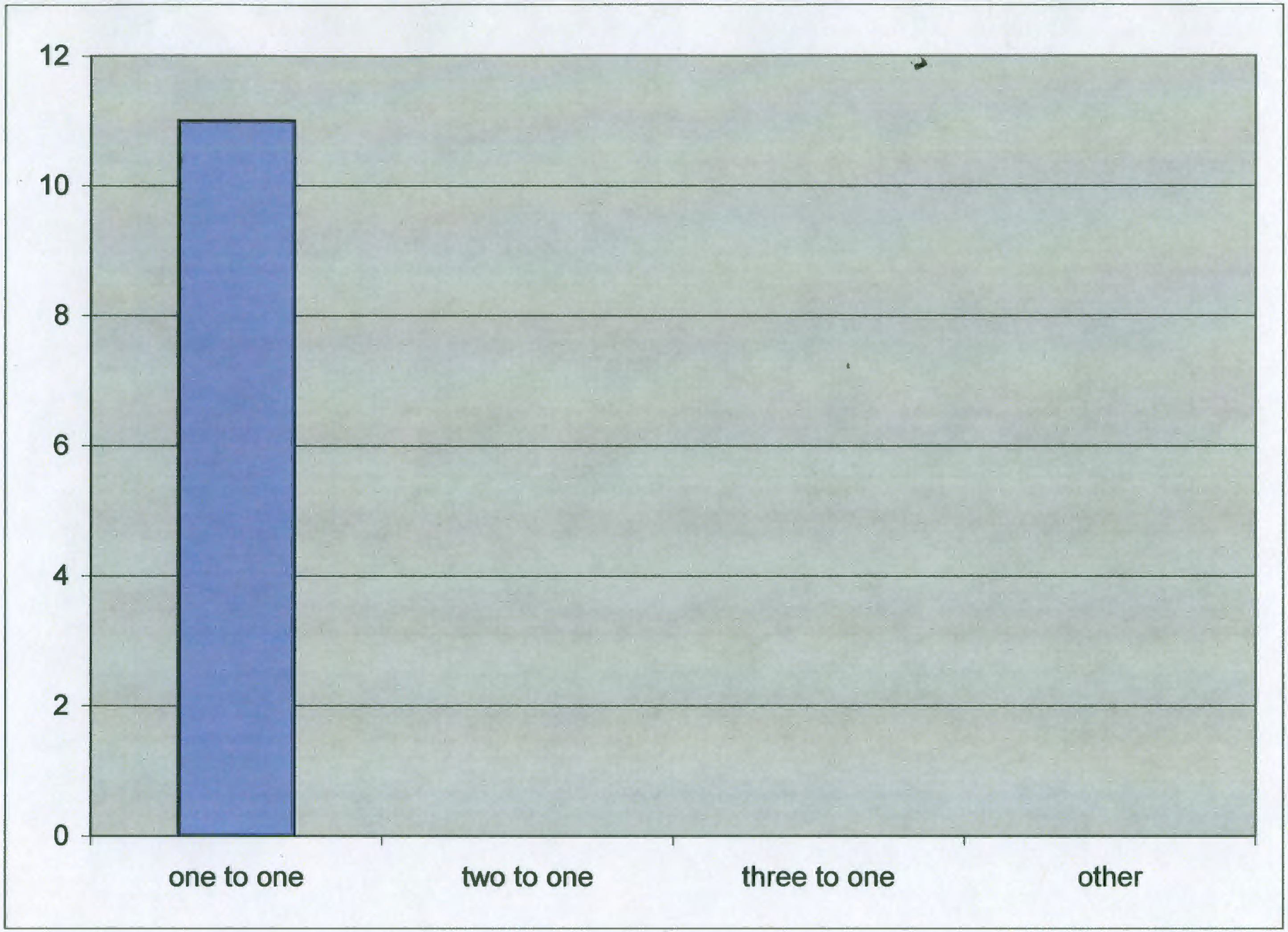

Figure 10

If the overhead projection is used, how often?

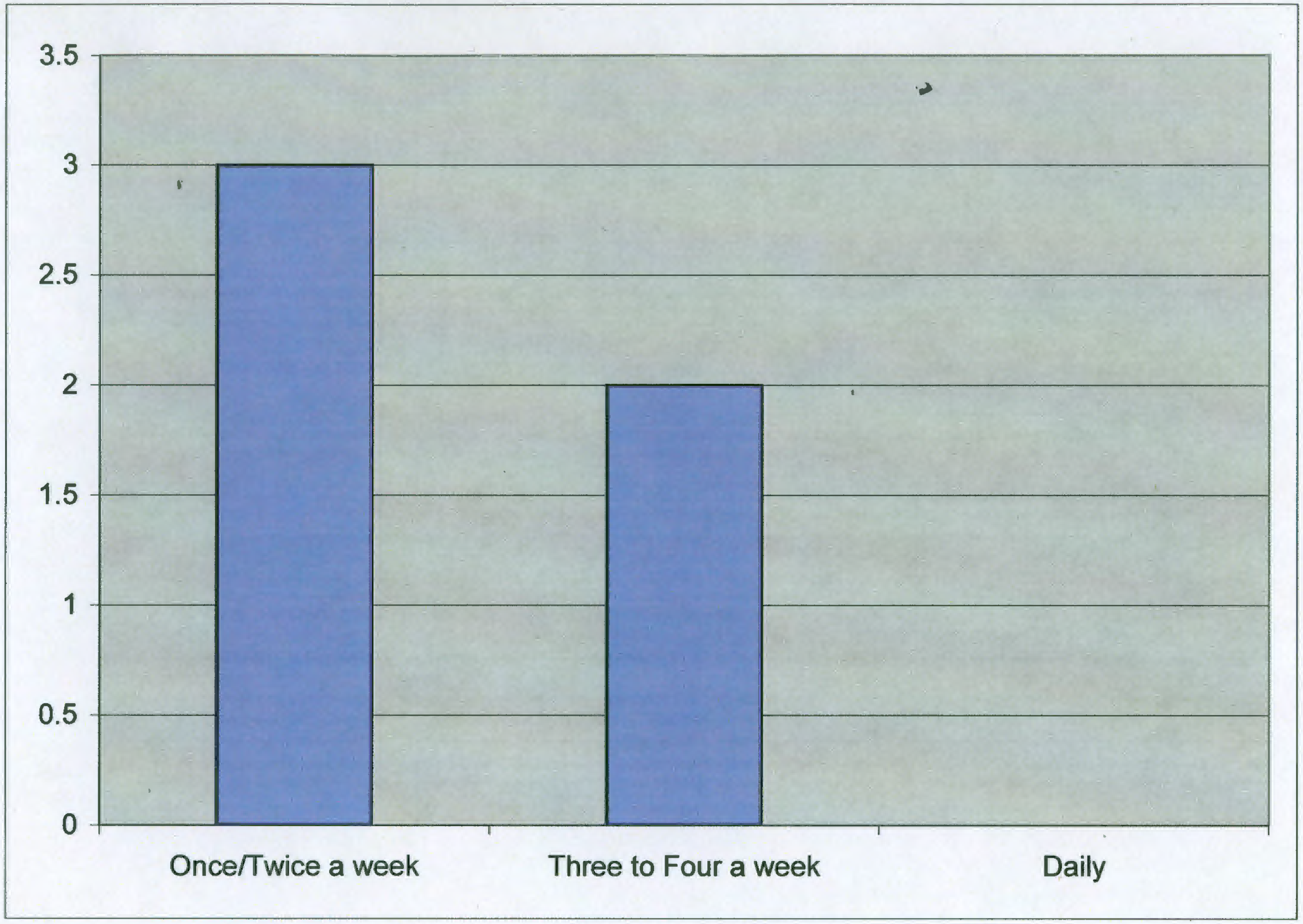

Figure 11

What type of strategies do you use?

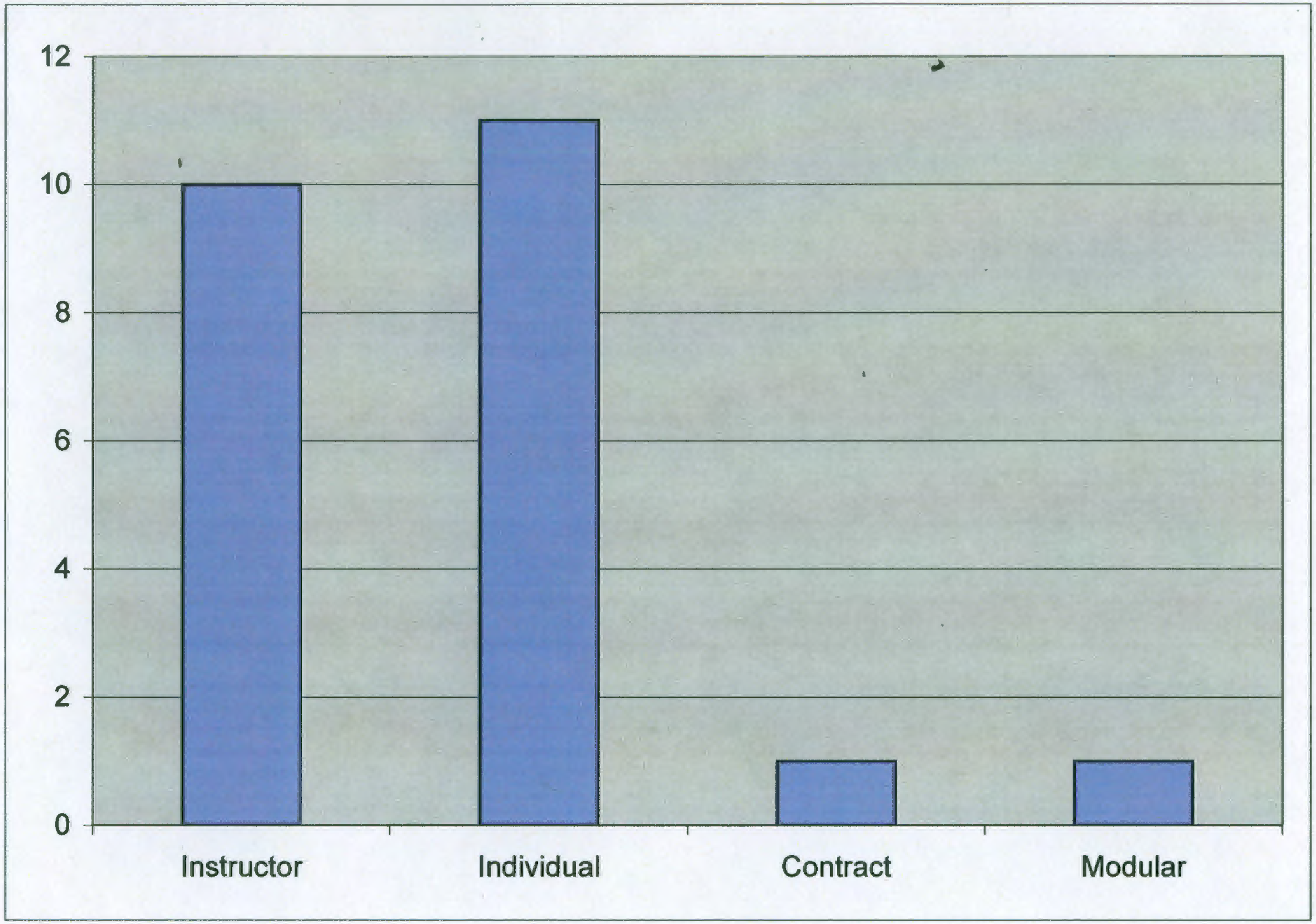

Figure 12

Is a type of CAD program used within the following classes?

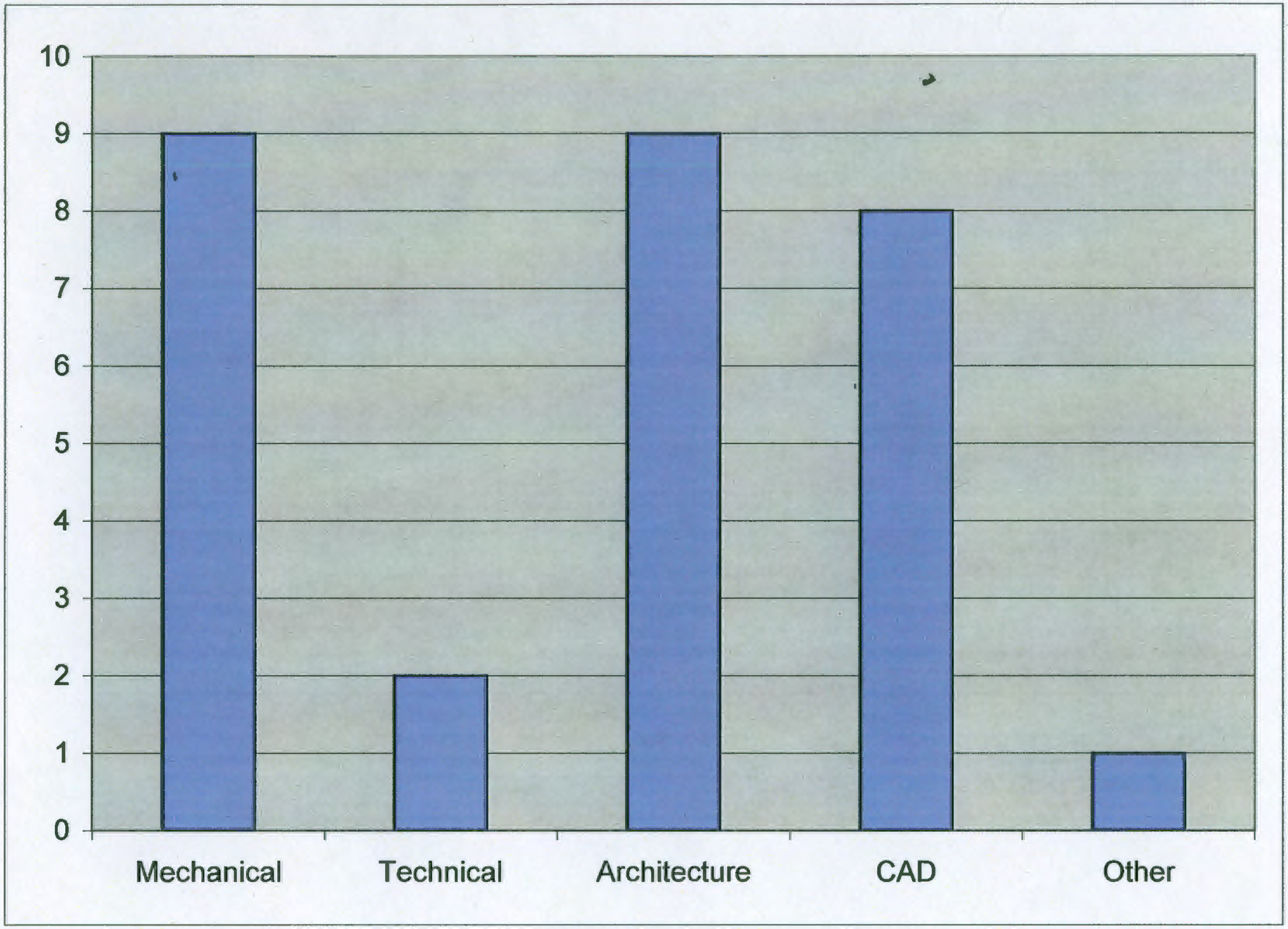

Figure 13

Is a CAD program used to draw the following type of drawings?

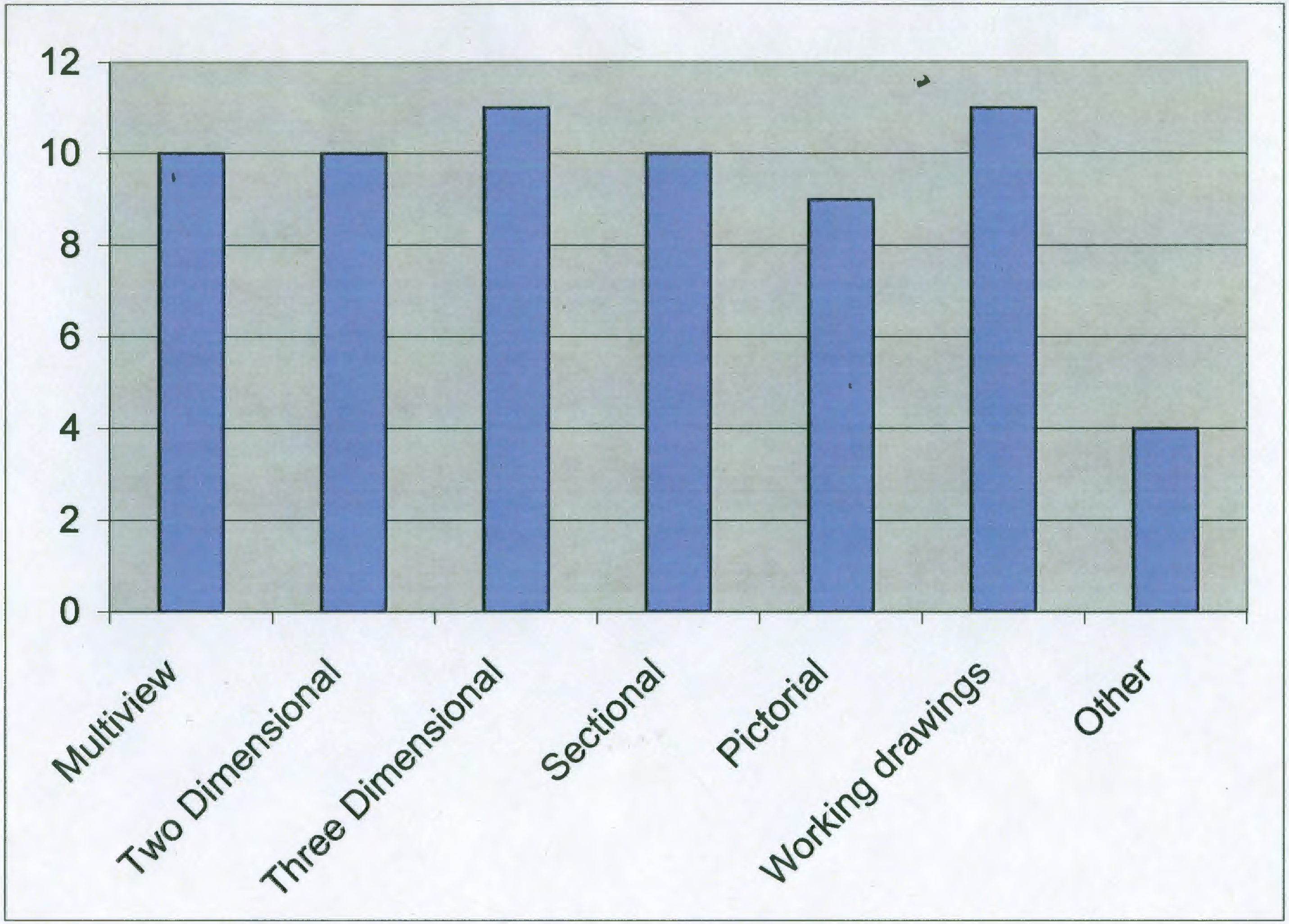

Figure 14

How many assignments utilized the CAD programs in each of the following areas?

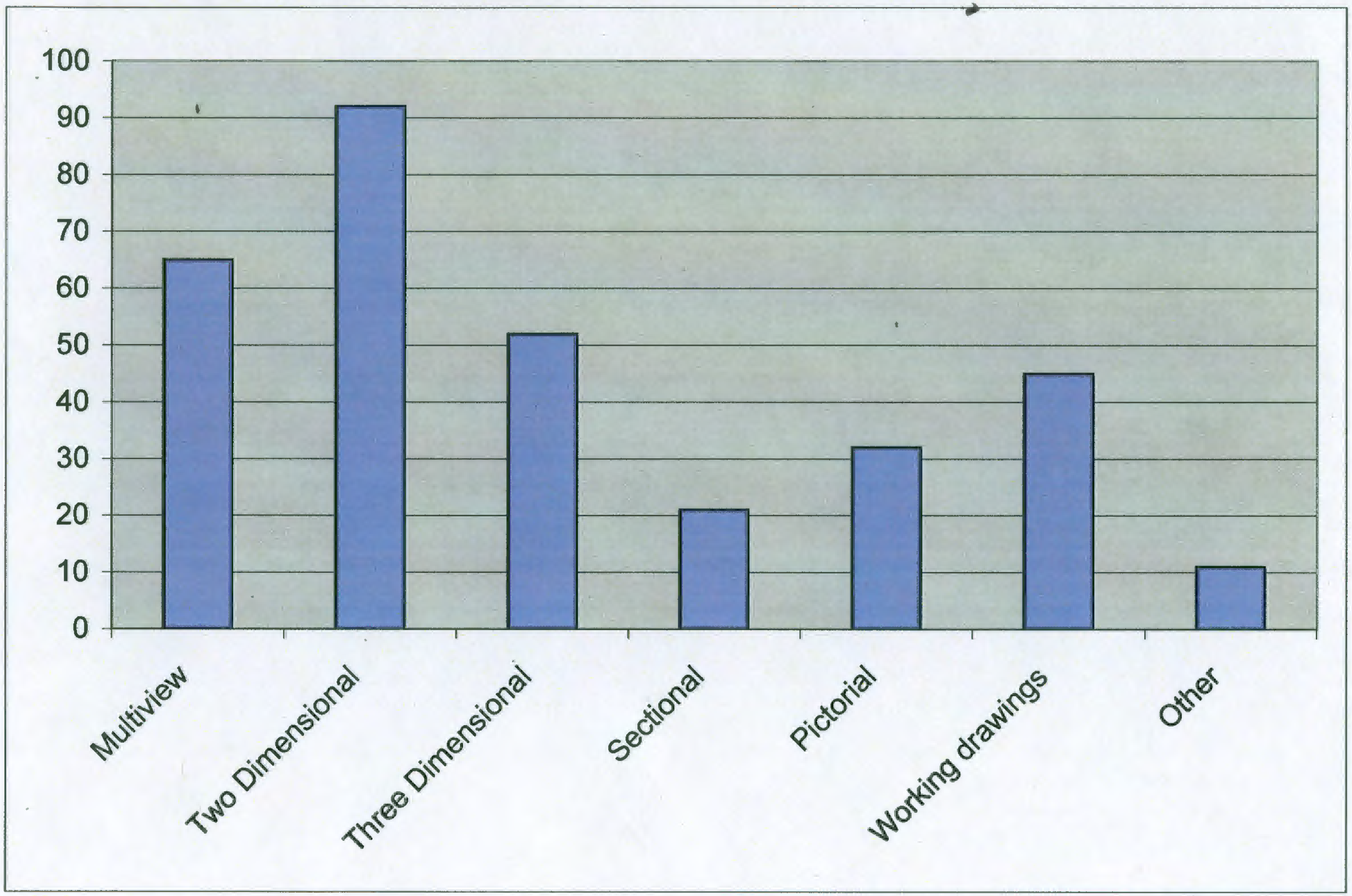

Figure 15

How many years have you taught CAD classes?

Figure 16