Mathematical and Computing Sciences Masters   Mathematical and Computing Sciences Department

5-2001

Back to the Drawing Board: Envisioning A Gender-Inclusive Introductory Technology Course

Eric Brewer
St. John Fisher College

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Abstract

In this new millennium technology permeates everything we do and see. You cannot work, act, or interact in society without using technology. Who is creating and working with this technology? According to Clark (1990) less than 30% of these technology users are female. Unfortunately, this is mirrored in secondary education as well. For example, here are the enrollment statistics for my drafting and engineering classes for the past four years: 1997-1998 School year - 0 females; 1998-1999 School year - 1 female; 1999-2000 School year - 2 females; 2000-2001 School year - 2 females. Since I have roughly 70 - 80 students a year, the female enrollment is a bit under 2% per year, which is unequivocally unacceptable. For whatever reason, females are being excluded from a large, high-paying field and, in this day when gender equity is a byword, females should be embracing technology, not shunning it. Many studies have been done as to why there is a lack of females in mathematics, science, and, to a lesser extent, technology. These studies look at the many factors that influence the development of females, including parents, peers, teachers, and guidance counselors. After reflecting upon what action I, a teacher of technology, might take to help redress this situation, I am proposing to enlist the aid of female students, and area technology teachers in envisioning a gender-inclusive technology curriculum beginning with a redesigning of the first high-school technology course, Design and Drawing for Production. Changing a course or even a curriculum is not enough in itself. First-year female high-school students' perceptions of the course and the curriculum must also change and this change of perception must take into account how helpful these re-envisioned high-school technology courses will be for accessing the many desirable jobs and careers that females will be filling in the near future.

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Introductory Technology Course

Eric Brewer
Thesis Project
May, 2001

Introduction

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Many studies have been done as to why there is a lack of females in mathematics, science, and, to a lesser extent, technology. These studies look at the many factors that influence the development of females, including parents, peers, teachers, and guidance counselors. After reflecting upon what action I, a teacher of technology, might take to help redress this situation, I am proposing to **enlist the aid of female students, and area technology teachers in envisioning a gender-inclusive technology curriculum beginning with a redesigning of the first high-school technology course, Design and Drawing for Production.** Changing a course or even a curriculum is not enough in itself. First-year female high-school students' perceptions of the course and the

curriculum must also change and this change of perception must take into account how helpful these re-envisioned high-school technology courses will be for accessing the many desirable jobs and careers that females will be filling in the near future.

Literature Review

There are numerous articles in the literature involving females in mathematics and science, but very few that deal with females in technology courses. I begin with two studies conducted in Connecticut dealing with females in technology course.

Silverman and Pritchard (1993) wanted to see why a disproportionate number of girls turned away from technology in the high school. In order to do this they focused on the experiences of females in three Connecticut middle schools. Silverman and Pritchard's (1993) research examined three main questions. First, what is the impact of teaching methods, classroom organization and atmosphere and teacher interaction on girls in technology education classes in middle school?" Second, Why do students decide to follow up their exploratory programs in middle school by taking further technology education classes in high school? Finally, are there significant differences between girls and boys in their attitudes toward technology education and technology careers? This study mirrors many aspects of my own and has given great insight into some of my questions and methodologies. Silverman and Pritchard (1993) obtained three results. First that in middle school females enjoy technology education. However, beginning issues of sexism among peers starts to affect participation in these activities. Second, girls are discouraged from taking more technology in high school because stereotypes still exist about what is appropriate for females to take class wise and career wise. Another issue was that females do not know enough about technology careers and the economic reality

about the world of work. I wonder though, how many students in general know about the economic realities in the world of work? Finally, the research shows that when females do take technology education classes they have much less confidence in their abilities in these classes.

Silverman and Pritchard (1993) did a second study. This study focused on the role that guidance counselors played in girls attending technology education classes in the high school. This study began to make me realize that there might be more than one issue playing a role on gender choices in technology education. In this study Silverman and Pritchard (1993) identified guidance counselors as the people that are able to directly provide information, break down barriers and help students explore more technology related options. The problems in guidance comes in three general areas. First, there is a lack of information that is given out to assist with females (I imagine students in general) understanding technology choices in both education and careers. Second, if the females are getting the information they need they are not being able to connect this information to there future careers. Finally, with all of the state requirements, there is a lack of flexibility in the high school schedule to work in technology education electives. On the defense of school councilors, many of these issues are a result of the councilor being extremely overworked.

I was able to find more articles on females in technology and computers but none on technology education specifically. One of these articles looked at how technology tends to be more attractive to males than females. Quilling (1999) argues that males are more apt to enter into technology careers and classes. In order to combat this she has

come up with the following list of educational strategies that schools should implement to fight gender biases:

- A two pronged approach for schools. First, to change educational policies (does not seem to share what these changes should be). Second, change instructional strategies to include the use of technology.

- Assure that school computer labs are available on an equitable basis.

- Provide staff training to enhance technology skills.

- Occasionally review and revise equity policies as necessary.

At the beginning of this review I stated that there were two reasons for expanding my search. At first it was a lack of articles. Once I began to look into my question I began to realize that there were many different possible reasons that females did not take technology education classes. Once I had this realization I began to expand my search to include gender and equity in education in general (not just technology education). The first thing I wanted to find out, is there still issues with gender in education? According to Sadker (1999) the following list is many of the gender biases for females in education today:

- Segregation still thrives today:
  - The majority of females major in: English, French, Spanish, music, drama and dance. The Majority of males major in: computer science, physics, and engineering programs.

  - A recent study identified that over 90% of women cluster in the following careers: health, education, graphic arts, and office technology.

- Public schools are beginning to create single gender schools.

- Gender related safety and health concerns continue to plague women:
  - 20% of schoolgirls are sexually abused and 80% are sexually harassed.

  - Girls are half as likely to participate in physical education

- Females who are supposed to repeat a grade are more likely to drop out of schools than their male counterparts. When girls do drop out it is usually due to pregnancy and is less likely to return and complete school than boys.

- Girls tend to take gifted programs in language arts and boys are more apt to take math and science. This reinforces gender segregation.

- Teachers tent to put males in the spotlight and females in the sidelines.
- A gender gap exists in technology.
  - Boys enter the schools with more experience than girls – girls know this.
  - Stereotyping is very strong in the technology field. Females tend to take word-processing and clerical courses. Males take advanced computer science and computer graphic courses.

Being obvious that there were still issues with gender in education I quickly found many articles and books on this subject. The American Association of University Women (AAUW) did one of the most in-depth research reports available. Looking specifically in the areas of Math, Science and Technology, traditionally male dominated groups, AAUW (1992) found that in math gender differences tend to be declining. They do note however, that as males and females get older the male dominance in this field tends to be more prevalent. In science the data shows that not only are the gender achievements still male dominated, but also this dominance appears to be increasing. In technology/vocational areas you find that females and males concentrate in predictable areas. Using teaching for example, women make up a majority of the following fields: consumer and homemaking, occupational home economics, health, office occupations. Males tend to make up a majority of the following fields: technology education, agriculture, trade and industry, and technical occupations.

Why is this happening? Lloyd and Duveen (1993) suggest that much of this begins at a very early age. As early as 2-3 years children are already labeling things (like clothing and toys) as being girl-based or boy-based. This is most likely a result of being taught it at home or from interactions with other peers. Lloyd and Duveen (1993) also find that many of these behaviors are being reinforced in the classroom. Teachers tend to feed these behaviors because of their own beliefs being played out in the classroom.

One of the strongest findings I discovered was in the area of self-esteem. The AAUW (1991) did another study on the interactions of self-esteem, education, and career aspirations in teenage females as compared to teenage males. AAUW (1991) states that "adolescence, the period of transition from childhood to adulthood, is a critical time for the development of self identity (AAUW, 1991)." Unfortunately in the research that was done by AAUW (1991), it was discovered that both boys and girls loose a significant amount of self-esteem during adolescents. Unfortunately, the most affected by this loss are females. The study also shows that that this lack of self-esteem is affecting career goals. The higher self-esteem of males tends to promote bigger career dreams while females tend to have lower hopes for their careers. What seems to affect self-esteem the most? According to the AAUW (1991) study, contrary to some belief, peer pressure does not have the greatest influence on self-esteem. What ranked the highest was success in school and feelings of acceptance in the family. Thus teachers turn out to be important role members in female self-esteem. Unfortunately, when many females reach high school math they find that many of their teachers (and many other people) believe that females cannot do the things that they are truly able to do (AAUW, 1991).

Methodology

Design of the Study

My research project comprises the following actions and products:

1) Increase awareness of the necessity for a gender-inclusive technology curriculum;

2) As a result of 1), collect ideas and curricular models from a web site I will develop for which I am currently the web master; this site will serve as a research resource for me and for other teachers and interested parties;

3) Create a viable, gender-inclusive first-year technology course, Design and Drawing for Production, that will be critiqued at the above web site as the course is being designed.

This project will be developed in five stages, the first three of which will be accomplished concurrently:

Stage 1: Surveying and interviewing adolescent females;

Stage 2: Increasing gender-inclusion awareness in the Four County Technology Education Association;

Stage 3: Expanding the web site for which I am web master to accommodate discussion and research concerning females in technology courses;

Stage 4: Development of new gender-inclusive curriculum and course;

Stage 5: Development of a promotional package to attract and recruit young women for the revised first-year course.

A time line for accomplishing these five stages is included in Appendix F and a more detailed description of these stages follows below.

Stage 1 - Surveying/Interviewing Adolescent Females
In this stage I would attempt to discover what females would be interested in learning in an introductory design class. I would be interested in surveying from three different groups. The first group would be high school females that have not taken the high school Design and Drawing for Production course. My second group would be female eighth graders. For these two groups I will first distribute a single page paper

survey (see appendix) to a small group approximately 25 females. This survey will be given on one day at the beginning of the period and need to be returned at the end of the period. The survey will ask for names and I will choose to interview 3-5 females from the questioner. The interview will happen within a week of the survey. For the interview I will question only one person at a time using a tape recorder to tape the entire event. My final group will be my three females that have taken the DDP class with me. For these students, whom I already know, a paper survey will not be necessary. Instead I will just do an interview with the three females. For the interview I will question only one person at a time using a tape recorder to tape the entire event. All of these surveys an interviews will take place in February.

Stage 2 – Local Technology Educators Group
I am an active member of the Four County Technology Education Association. This organization is for technology education teachers in the Wayne, Ontario, Seneca and Yates counties. This association attempts to discuss and address issues facing technology educators. The group also endeavors to be a support for technology educators by providing ideas for curriculum and networking with other teachers. We meet every other month at different schools in the four counties. For the next meeting, which is to take place in January, I plan to hold a discussion on woman issues in technology education. I will have the group break up into two groups. These two groups will be middle school and high school teachers. I will have the middle school teachers discuss the following topic - How can we make females more comfortable in technology education. I will have the high school teachers discus the following topic: What can we do with our curriculum/program to attract females. Both groups will have a scribe and be video taped. We will discuss this for 10-15 minutes. Then, we will come back as a group and discuss

some of the answers. If time allows we will discuss the following: How do we view females in our program and do we need to change any of our views? I will also have a survey for the teachers to fill out and will ask for volunteers to take my surveys that I gave to my females, back to their schools and administer in their districts. These surveys will need to be completed and returned within two week in order to be counted.

Stage 3 – Web Page

I am also the web master for the Four County Technology Education Association web site. This site can be found at: www.fourcountyteched.org. As a part of my research I would like to as a section to the Four County site that will deal with females/equity in technology education. The web site will:

- ❖ Establish a need for action & new approach
    - ➢ Identify the standards that call for equity
    - ➢ Run some statistics from people in all areas of technology
- ❖ Come up with Ideas for:
    - ➢ a new curriculum for the class
    - ➢ new materials
    - ➢ recruitment strategies.
- ❖ Have teachers submit ideas for topics, drawings, activities
- ❖ Have a discussion list on:
    - ➢ Projects females enjoy
    - ➢ Making girls feel comfortable

I currently plan to launch the web site on the day of the next Four County meeting in January. See the appendix for a tentative map and outline for the web page. This web page will become a permeate part to the Four County web page. Therefore, this research

topic will not end at the end of this course, but be a continuing entity for the life of the web page.

Stage 4 – Revised Design and Drawing Curriculum

My fourth stage will be to create a revised DDP curriculum. The revision would start from the curriculum that was created as an independent study during the summer of 2000 and is currently being used in the Design and Drawing for Production class at Newark high school. The revision would focus on creating a curriculum that would adapt depending upon the interest of the student. All state standards and curriculum must be integrated and followed. There would be three revisions periods. First a general revision that will be completed by the presentation at the end of this semester. This will include my thoughts as to how the curriculum should change to attract more diversity on my program. My second change will be a result of the surveys/interviews from junior high/high school, and the Four County discussions. This should be completed by the end of February. My final changes will happen in the middle of April. These changes will be a result of the discussions and happenings on the web.

Stage 5 – Promotional Package

After creating the new curriculum I would create a promotional package that would effectively mirror the new curriculum. This package will contain a poster aimed at three groups. The first group will be white males. The second group will be females and the third group will be minorities. I will have a rough idea of what the poster will look like for the presentation in the fall semester. See the appendix for the example. A rough draft will be created in the beginning of April. This rough draft will be shown to at least three people in each group. Their reactions will be noted and changes made from this. A final copy will be created by the end of April.

Presentations of Results
<u>Stage 1 - Surveying/Interviewing</u>

Stage one consisted of the following steps:

- Surveying females from the high school that have not taken the Design and Drawing for Production courses
- Interviewing a couple of females from the high school that have not taken the Design and Drawing for Production courses
- Surveying females from the high school that have taken the Design and Drawing for Production courses
- Interviewing the females that have taken DDP
- Surveying females from the eighth grade
- Having teachers from the Four County Technology Education Association survey their classes

The surveying in the high school and middle school happened in the beginning of

February. In total there were 126 surveys.

High School Females That Have Taken Technology Education.
Number of Surveys: 33

Age 14   3
       15   6
       16   7
       17   15
       18   2

Hobbies: Sports, jet skiing, music, skiing, shopping, drama, singing, swimming, friends, music, snowboarding, phototaking, movies, guitar, collecting shells, concerts, drama, drawing, outdoors, dance, making things, colorguard, rollerblading, piano, student council, taking care of hamsters, thinking, art, volleyball, race car driving, working on cars, sewing, reading, violin, computers, puzzles, surfing the net

How do you feel about technology education?:
- I like making things
- I like working with hands on projects give you more responsibility
- It should be an optional class, it is very educational
- (8) It's fun
- It's a good opportunity to find out what you are really about
- I think it is a good opportunity for high school students - to get hands on experience
- Like photography, like class, like teacher
- (2) It was interesting
- I love technology, its my favorite class

- I think that it is good to learn about all areas
- To much sitting behind a computer
- I think it's going in the right direction. There is an increase in females.
- Certain parts are fun such as designing and creating prototypes, the math and science involved can be a little interesting, some times it can be a little dry.
- It is fun because some times you get to move away from standard classes and work hands-on with something.
- (2) I really enjoy this class
- It is interesting and fun to do - easy if you know what you are doing - basis for my career
- I love it, as long as you like it and are interested in it it's a fun thing to do
- I think it is very interesting
- It is a great thing to learn and a great skill to have.
- It is important because computers are involved with everything in our lives
- I think it is useful knowledge for both females and males
- Basis of the world today
- It is useful in experiencing what's going on in technology today
- More productive and educational than conventional learning, hands on learning allows you to learn at your own pace
- I think it is great and we should offer more courses involving technology

What made you choose to take technology education this year?
- Because it was fun and you get to do hands on stuff
- Because I love to take pictures. It's relaxing
- I like to work on projects instead of sitting in a class
- I wanted to learn how to develop film and gaining more skills for the future
- My dad does it, I find it very interesting
- The machinery I was able to use
- I love working with wood
- Like pictures, photography
- Because I like taking pictures
- It looked like fun
- I like all the projects and getting to build things
- (3) I want to he an Architect
- I have a natural aptitude for math and sciences and technology interests me.
- I will be getting into engineering in college
- A major I was looking into said it was beneficial to take the course.
- Since I am into hands on projects I wanted to know about the drawing plans that go into making something.
- I took it to better understand and help when I go to college and need to understand the programs (An introduction)
- I love to design houses
- I wanted to try something new
- Something different

- My technology teacher last year recommended it to me.
- I liked the class last year
- (2) It is a field that is growing and almost every career will need to use it in the future
- I need a back ground in it because I am going to college for science and technology.
- I wanted to see how it was as a programmer.
- It sounded interesting and I liked to play on the computer
- I was interested in math and from previous technology classes
- The new computer lab
- I want to go into it when I am older

Who in your life most influences your decisions?

Myself   12
Parents   11
Friends   3
Father   5
Mother   1
God   1
Brother   1
Sister   1
No one really, Liked it in seventh grade

What activities would interest you in a drawing/drafting course?

7 - Not sure
5 - Buildings/Houses
3 - Cars/transportation things
2 - Things that I can come up with - Not like a template
Shapes-colorful paintings
Surreal pictures & painting
Drawing
Guitars, and their design
I do not like drawing very much, I am not very good at it
The courses are fine the way they are
Hands on Problem Solving Projects (Junk Yard Wars)
Projects/Problem Solving - Not out of a book
More houses, I can never get enough of designing them!
My own house
I don't care as long as it is fun!
Anything using CAD and CNC designs
Computer Programs
The real thing - nice to see how it works

Who do you think is better at technology?

Girls   5
Boys   5
Both   23

- It depends. In materials processing one I made a box that was just as good as all of the guys. And my extruder was one of the best. I depends on the level of interest. I can use the tools and things just as good as boys.
- Yes, it is more common to se males in the technological field, Although, I believe any superiority comes from the individual brain, no matter what gender.

Who do you thing is better at science?

Girls	4
Boys	3
Both	26

- Often times girls are more conscientious than guys, but sometimes guys are more into how things work. I love science and both girls and guys could be just as good in it.

Interviews with Females that have taken DDP

I was able to interview a couple of females that have taken drafting and engineering classes. Below is the first interview I conducted:

Q: What made you take DDP?

A: Because I was interested in the design of houses.

Q Did you know that Architecture was not a part of DDP?

A: Yes. I wanted to take an introductory course before I went into architecture.

Q: Do you know what inspired you to design houses?

A: Always been interested in - done sketches in the past.

Q: What do you think of DDP

A: Could have been more interesting - Was not as mechanically inclined - helped introduce me to technical aspects of the drafting world.

Q: What would you like to see in DDP to make it more interesting?

A: For me- more things to do with the house and building structures. Not so much with mechanical pieces.

Q: What do you think could be done so that females would be more interested in taking this course?

A: Depends upon different opinions - maybe advertise in different ways - maybe show that women are involved with technology and it is not just men.

Q: Do you think that there is a preconceived notion towards this type of class or technology?

A: I think technology in general turns girls off - before I looked into it I associated technology with Automotive.

Q: Do you have any thoughts on why there are so few females in the engineering/drafting field?

A: I think that some women think that they can't do it. They do not try because of this.

Second Interview

Below is the second interview I conducted.

Q: What made you want to take DDP?

A: Wanted to try something new

Q: What did you think DDP would be about?

A: Thought it would be a drawing class (like art)

Q: What do you think of DDP

A: Very interesting class - learn a lot of stuff from it. - learn more about computers and how to use them.

Q: What would you like to see in DDP to make it more interesting?

A: More technology stuff - stuff from around the world - different things

Q: What do you think could be done so that females would be more interested in taking this course?

A: Nothing can be done - if they are smart they would take it- that is where the boys are.

Q: Do you think that there is a preconceived notion towards this type of class or technology?

A: In the middle school - it was just building - that is what I thought we would be doing in the high school

Q: Do you have any thoughts on why there are so few females in the engineering/drafting field?

A: Probably think most females think it is what men should be doing.

Survey Results: Females in HS that have not taken DDP

Below are the results of the high school survey of females that have not taken technology education. I tabulated 29 surveys.

Age
- 14 - 1
- 15 - 4
- 16 - 4
- 17 - 12
- 18 - 7
- 19 - 1

Hobbies: Working Out, Dancing, Cheerleeding, Talking on the Phone, Singing, Swimming, Art. Working on cars, Shopping, volunteering at nursing home, painting, drawing, design, piano, swimming, acting, kayaking, listening to music, sports, reading, computer, horseback riding, writing, music, kickboxing, motorcycling, crafts, snowboarding, modeling, theater

How do you feel about technology education:
- Don't like
- (2) Very Boring
- (4) Not interesting to me
- Confusing and to too detailed
- It is a good opportunity to fix/do things on your own

- I don't care for it that much but it is OK
- (2) Important
- (2) Interesting/Useful
- (6) Interesting for people who are interested in pursuing engineering careers
- I feel it's a good field for boys to take, girls don't concentrate on tech
- I didn't really like it in the middle school - my teacher always graded boys better even though I worked just as hard.
- I think that it is gook that it is offered and available
- It is a very in depth and complicated field
- I haven't taken anything basic tech and ad design, I liked both
- (2) Don't know
- Very good
- It is very important for the future

Why did you not take technology education this year:
- Do not like working on computers.
- (2) I did not know anything about the classes
- (8) Did not interest me
- It is boring and confusing - I don't do to well in it
- (8) My schedule is full
- I needed classes for my major at college
- Not majoring in it
- Other requirements to fulfill
- Lack of knowledge lead to a lack of interest
- I decided to take other electives
- My line of study isfine arts
- Chose other classes instead
- Senior year - wanted to relax
- No girls in classes

Who in your life most influences your decisions?
Myself   7
Parents   8
Friends   3
Father   2
Mother   8

What activities would interest you in a drawing/drafting course?
- (3) Designing a house
- Designing Furniture
- Useful things or more artsy projects than just wooden stuff.
- Designing the interior of a house
- Buildings, Amusement Parks, Malls, Homes

Who do you think is better at technology?

Girls	2
Boys	11
Both	17

Who do you thing is better at science?

Girls	7
Boys	3
Both	19

Interviews with Females that have not taken DDP
Interviewing a couple of females from the high school that have not taken technology

courses produced the following results:

Q: What did you think of technology education in the middle school.

A1: Thought it was fun - All hands on - not all paper work

A2: OK - Better than sitting in a math class - It was fun depending on what we were

doing - rockets were fun - cars were not.

Q: Why did you not take technology this year.

A1 - Seemed like all paper work - not hands on - brothers gave idea

A2: Did not interest me.

Q: When you thought of high school technology what comes to mind. -

A1: Taking notes

A2: More interesting than Middle school - building things and designing things

Q: What areas of technology interest you?

A1: Photo

A2: Building things

Q: If you were to take a design class what would you like to design?

A1: Houses

A2: Furniture/chairs

Q: What would turn you off to designing in the high school?

A1&A2: Cars

Q: Why don't more females take technology education

A1: Traditionally stereotyped for guys to take - building cars - So many guys taking classes makes me feel uncomfortable

A2: threatening to girls - very intimidating because of the amount of guys

Q: Any other comments?

A1 & A2: lack of female teachers makes it more difficult for females to feel comfortable taking technology classes - feel it is easier to be taught by females - more comfortable/understand you better.

Survey Results: Females in Middle School

Below are the results from the middle school survey of females. I tabulated 64 surveys.

Age 13   40
14   20
15   4

Hobbies: Swimming, Running, Sports, Singing, Phone, Internet, hanging w/ friends, running, crafts, arts, computer, acting, amusement parks, playing instrument, writing, shopping, karate, dance, cheerleading, horseback riding, skiing, snowboarding, walking, four-wheeling, composing, stargazing, painting, listening to music, writing poetry, talking on the phone, writing, watching tv, walking, reading, rollerblading, talking, collecting things

How do you feel about technology education?:
- Sometimes it is fun but then again sometimes it's boring.
- It's fun, educational, different and interesting
- It's cool
- I feel that it's an important subject because it allows you to do extreme hands on and work with others in an unfamiliar environment
- I think technology is very important to learn. Technology changes & has changed our world & will continue to do so

- Í think it is ok but maybe not necessary
- I like it because I need to be able to take care of my car in the future
- I think technology education is good and should continue to grow and stay in schools.
- It is ok but I am afraid that I am going to cut my finger off.
- I think it is boring and hard
- I think it is better than most classes
- I think it is useful but sometimes boring
- I like technology and learning how things works.
- It's a good experience to work with science in a different perspective
- I like it - it is fun to do hands on learning
- I think it is kinda of interesting but really boring if it is not hands on
- I am glad we have it because it is a break from the norm
- Break from the normal classes
- I like building things even if I don't understand half of it
- One of my best subjects on school
- My dad builds motor cycles and I am kind of familiar with it
- It's fun if we do stuff that involves working with other people
- I feel that the inventions are fun but if I had a choice I wouldn't choose it
- The building part is fun but designing is boring
- I like putting fourth my math and science skills

Do you think you are going to take technology education next year?
Yes   26
No   28
Maybe   7
Don't know   2
Only if I have to   2

What made you want to take Technology Education?
- It will help me with a job some day
- Because it is fun
- Better than health classes
- It's cool
- I like learning about technology and want to know how things work
- I love technology ant the areas it revolves around. I think TV production is great
- I enjoy extreme hands on work and physical environment
- I am interested in broadening our country's scientific and technological horizons
- I want to be a mechanic
- Because I want to learn to work on a car
- I am going to take cad next year I want to learn to how to do stuff and create things
- It is different from studying from a book and taking notes from a regular classroom
- It is boring to just sit at a desk
- I thinks there is a bit of art in technology
- I always have a lot of fun and would like to learn more about technology

- Most interesting course to fill in my time
- Love to take things apart and see how they work
- My dad got me interested in cars
- Want to be an architect
- Learn more about computers
- (4) Like to build things
- I have always wanted and liked technology education
- (3) Making things is fun
- (2) I like taking pictures
- The projects we did last year

What made you not want to take technology education?
- I don't Really like working with tools
- Because it is not me
- Tech is not one of my passions
- I am not the quickest thinker with pen and paper
- I don't want to cut my fingers off
- There is more opportunities to take other classes
- Other classes I have more interest in
- I am not good at biding things and working with big tools
- It is not offered at Bishup Kearny and it is to difficult
- (5) Boring
- Bad at it
- Because nothing I want to be has to do with technology
- Other sections seem to be more interesting
- Working towards other credits
- Difficult some times
- (3) Schedule is full of other classes
- Because I don't understand
- (4) I don't like it
- I want to do other things
- To hard
- I have better things to learn
- I hate working with wood and building things
- I only enjoy building and working with my dad

Who in your life most influences your decisions?
Myself   19
Parents   10
Friends   10
Father   7
Mother   11
Teacher   1
Cousin   1

Boyfriend	1
No one	1
Sister	1
Grandma	1

What activities would interest you in a drawing/drafting course?

- Designing and Creating Clothing
- Cars
- House/Buildings
- Motorcycles
- Things that actually work but are completely pointless
- Things that are useful in everyday life
- Four Wheelers
- Better/faster communication system
- TV/Radio combo
- Cosmetology
- Horse Back riding devises
- Skiing/Snowboarding design
- Shopping Mall
- Picture Frames
- Robots
- Beauty Salon
- Clock
- CD Player
- Models
- Ceramic Objects
- Furniture/Dresser

Who do you think is better at technology?

Girls	0
Boys	21
Both	43

Who do you thing is better at science?

Girls	14
Boys	3
Both	44

At our Technology Education meeting in January I asked technology teachers from other districts if they would be willing to survey their classes (See appendix A&C). I unfortunately had only one high school teacher from the Canadagua School District

respond with seven surveys. The results from this district are combined with the results above. I had a middle school and high school teacher from Webster return surveys as well.

Stage 2 - Group Discussion

Stage two happened at the Four County Technology Education meeting in January. I broke up the people at the meeting into two groups. Originally I thought that I would break the groups into middle school and high school. However, I only had two middle school teachers so I just broke the room into two groups. As they were discussing a question I gave them I video taped the experience. There were approximately 20 teachers and they had about five minutes to discuss the question. Below is a transcript of the videotape.

The first group I asked the following question: What can we do with our curriculum or program to attract females

Transcript:

- How much influence do the guidance have on the females?
- There is not only an issues of females but some of the better students as well. One of the issues at our school is that these groups were indicating that guidance was discouraging them from taking some of the technology classes. So not only is it your females but some of your better students as well. But his issue is females.
- Yea, But the guidance councilors can steer the females in the wrong direction
- I would think that they have some influence over that
- I teach communications and photography so my enrollment is 60% with girls
- So the curriculum kind of helps it attract women
- Yea, That doesn't require any promotion it just happens because those are the courses they want to take
- Did you say 60%?
- Yea, in fact some of the classes are 100% girls it just happens that way. You can promote you can put posters up you can do what you want to do they are going to take what they want to take and that's it.
- A lot of is awareness. One of the things our school allows is a student secretary through the business department. In one year I had a girl running off

copies and coming in the room. She had no idea what we did in there. She told a couple of friends. Next semester I had three girls and it started to grow. It is exposure

- It is comfort level it really is. If they find out that they are in a class by them selves and there is a class with eight of their friends then they will switch.
- That is a good point
- You are strictly photography?
- Photography, communications and web design
- I think at my school in order to solve the art requirement the boys take DDP and the girls go to chorus. And that is where you loose them and you don't get them back because you loose them as a freshman. Out of thirty males I have one female.
- They have to be turned on in the middle school. We run a career day and one of the things we try and do is have non-traditional speakers. Like a female engineer
- Hey, you know that is what I was thinking, female engineers and architects
- Going on that idea we had a guest speaker from ICON she was a female and came in to all the DDP classes and spoke. Maybe if they opened that more broad where she went into all the classes more of a forum idea
- Is Connie still there (a female teacher at Victor)?
- Yes
- How many females does she have in her class?
- Similar. I was thinking of Karen. I was thinking also of how a female instructor would influence numbers but it does not appear to have paned out, not in our situation. You are talking about two in a class of 19 and it depends that is in DDP I see a few in communications I have one girl in materials process and another in another section of that.
- I think it depends on the school district. I think on communications - Newark has a communications class where word gets out but if you do like wood working
- Wood, metal and
- So maybe if you had a guidance councilor that pushed technology as a freshman, I think it is different for different schools.
- An they do not want to get their hands dirty. You can promote all you want but they are not going to want to take the class. Obviously to explore, to show them the option is there is the best you can do.
- Girls don't even know what we are teaching down there so they develop a bias that that is for the boys and I am not going to take it.
- See the thing is that they all have the exposure at the middle school. I wonder what happened there because they have all had it. As not as being aware of what happens there? They were at one point.

The second group I asked the following question: What could we do to make females more comfortable in our programs?

<u>Transcript</u>:

- One thing we could do is to get over the fact that when a group of guys get together that they don't want a girl around and when a girl joins a group of guys other girls give her a hard time. That is what happened in my classes. A girl signed up and guidance put them in a small class with no girls and her friends says "what are you doing?"
- Could activities be tweaked to make them more interesting for females? Maybe you have male orientated projects because that is what you came up with.
- Activities should not be gender based activities should be for every one.
- But if you are engineering something you could be designing a hole bunch of things. Make some of the things you are designing more appealing to females.
- Well we engineer a lot of vehicles: Maglev, CO_2 cars all different type of vehicles - these might be male type of things.
- A lot of times if I am doing an example of hydraulics I will use an example of car breaks, steering-
- Girls don't drive cars?
- well the girls do drive cars but they don't want to have anything to do with that stuff.
- In DDP we address this problem we found when we did the project where you redesign your bedroom the girls enjoyed this project more than the guys. The girls actually went into the decorating - they went onto web sites and found some furniture they actually carried that project -
- I always found that girls do better on projects than boys
- You can change activities all you want - how do get the girls to know that you have changed the curriculum - get them to know you have changed the class?
- You have a hurdle in many guidance offices.
- But the other thing too is that if you have changed your activities to be more female friendly it would to take 3-5 years to happen but it would be a word of mouth thing that would slowly get to the councilors - and they would start to talk it up to their students - like we have three grade levels in our middle school. When we make a change in the eighth grade it takes multiple years to take effect - it can't ha ppen in one year.
- If we insert female activities into the curriculum they would you loose your males?
- No - you just have to be highly careful on how you choose them - I mean you could do things that wouldn't offend either if they were carefully chosen - some of the things we do right now probably offend some females - I am sure they so.
- I know that Peter is teaching DDP down in Dewitt and he is very popular with the girls because he coached girls volleyball in the middle school. Because of this nearly 40% of his students were females - he was taking them away from

art. His DDP class lead right into his cad and architecture class and they
stayed with that.
- What is one of your big favorite activities you do right now?
- Bridge building
- See we do bridge building in the middle school so that would be---
- Gender neutral
- -----lead towards the males
- What? One of the things females should be getting interested in is engineering
- What I am saying is that you can engineer anything it doesn't have to be a
bridge - it could be anything else - I can't think of anything right now - you
could make something out of balsa wood you could use the same design
constraints it just doesn't have to be a bridge.
- When swatches were popular I used to use swatches for my design project -
the guys would do things like put magnifying glasses to enhance it and the
girls would concentrate more on the design.
- I did an injection molding activity where I had the students design a logo and
they had to mill it out - I did not have a lot of girls but the girls design __?__
- Do you have more girl in the world of technology class?
- I don't have any
- Last year I had about half - that was because the guidance department wanted
those kids to get a math/science credit - so there is another draw

Stage 3 - Web Page

In the middle of January I launched the first part of he web page. This was

announced at the Four County Technology Educators meeting. I did some research on to

how I could make an interactive way to do a newsgroup/discussion board. I found a site

called egroups. After exploring this service I found that I could do many different things.

The two things that were potentially important to this thesis is the Database and the Mass

mailing. The way this service works is that you create a group about a specific subject, in

this case it is Technology Education. The database is like a news group. You can set it up

to allow others to post messages to it like a discussion board. People respond to the

messages and a discussion on the Internet ensues. I can also mass mail information and

comments to every one that has signed up for this service. The entrance to this group can

be found at www.fourcountyteched.org under the forum link.

As of the beginning of April there were a couple of people that has signed up for the group but nobody had participated in the discussions. In early March I met with Dr. Emmerson do discuss some other options as to how to overcome the apparent lack of response to the group discussion that I had created. The two ideas we came up with were to first see if my local news group had any active groups discussing female engineering issues. After doing extensive searches in the female engineering groups on my local server I was unable to find any discussions on this topic.

The second idea was search for any female engineering sites that might have any or know of any discussions on young female engineer issues. We discovered one main site on female engineer issues, however, there were no apparent discussions. This site is the Society of Women Engineers (www.swe.org). There were some other sites but they all appeared to be local branches of the main site. I then emailed a couple of contact people from this site to ask them if they knew of any young female discussions that were happening on the Internet. I received one response back from a lady who indicated that she was not familiar with any Internet discussions of this sort. In her letter she recommended two web sites that might assist with my paper. The first site, WOW, I was unable to find. The second site, iwitts, focuses on "provides training, e-strategies, publications and technical assistance to the education system and employers to integrate women into technology and law enforcement careers". Attached in the appendix is the response I received. These sites will be reviewed in the conclusion.

Stage 4 - Revised Design and Drawing Curriculum

The fourth stage of this proposal consists of the recreation of the current Design and Drawing curriculum to reflect the findings of the research. Three changes happened.

Initially, a rough outline was created for the December presentation. A second more thorough curriculum was created in March that was a result of the research done up to that point. There were two changes that were made in these first two revisions. One of the changes reflected a change in curriculum due to program changes. The other modifications were a result of making the curriculum more desirable to varying interests and groups (focusing on females for this study). The last change is a result of reactions to the modifications from a select group of teachers and (female) students. The actual changes will be discussed in the final section.

Stage 5 - Promotional Packages

The final piece is a promotional package that is put together to do two things. First is to help educate students about what technology education is all about. Second is to help promote the program. The particular focus that this paper will have is promotion for the female population. The proposal identified the need for posters - one of which was created for the December proposal. However, other promotional ideas have been identified as a result of my research this semester. These different promotional methods will be discussed in the conclusion section.

Analysis of Results

Introduction

The ultimate goal for this research project is to attempt to implement different ways to attract more females into the drafting and engineering program at the high school level. I proposed several different ways to gain information and change my program to do this. The ultimate change comes in the form of a curriculum rewrite (Stage 4). This rewrite attempts to reconcile the apparent nature of the course being more male activity orientated than equity based. In order to achieve a better understanding of how to change the curriculum one must research different ways to improve the curriculum. This particular research project sought this information from other teachers and female students. Students were asked in the form of surveys and interviews (Stage 1). I attempted to use two different forms of information gathering from teachers. The first was a video taped group discussion with technology teachers (Stage 2). The second was a web site designed to generate on-line discussions (Stage 3). Finally a promotional piece was necessary to attempt to get information out to educate students as to what technology (specifically engineering and drafting) is all about (Stage 5).

Stage 1 - Surveys

Conclusion of Surveys and Interviews

From the responses of the surveys I found two major differences between the females. First there is a group of females that do not appear to have any interest in taking technology. From the eighth grade surveys I found roughly half of the girls were not interested in taking technology education classes in high school. The second groups of females are ones that are interested in taking technology education. Again, in the eight grade that was about half. However I would question these numbers. This is because we

have about 60 females in our total technology program. Our school has a population of about 450 female students. This means we have roughly 13% of the female population of our school taking technology education classes.

There is actually a third category that can be pulled out of the first two categories: females that do not know what technology is all about. Comments tended to have two commonalties. One is the females that stated that they knew nothing about technology. The second category was the females that equated technology with building and manufacturing. Much of this information will be used in Stage 5 -the promotional piece.

Ideas of Projects from Surveys

One of the concepts of this research project is to create projects that are more interesting to females. Part of the survey was designed to see what females would be interested in creating. The most overwhelming things that females wanted to design were houses. The second most popular thing that females were interested in are automobile designs. Some other popular answers included: buildings, furniture, clothing, and interior design. Below are some others ideas that were expressed (in no particular order):

- Motorcycles
- Things that actually work but are completely pointless
- Things that are useful in everyday life
- Four Wheelers
- Better/faster communication system
- TV/Radio combo
- Cosmetology
- Horse Back riding devises
- Skiing/Snowboarding design
- Shopping Mall
- Picture Frames
- Robots
- Beauty Salon
- Clock
- CD Player
- Models

- Ceramic Objects
- Useful things or more artsy projects than just wooden stuff.
- Designing the interior of a house
- Amusement Parks, Malls
- Guitar

Stage 2 - Local Technology Education Group

I am very fortunate to be a part of a local technology education group (knows as the Four County Technology Education Assoication). This group meets every other month to discuss issues pertinent to technology teachers. I was able to have a videotaped discussion at our meeting in January on issues pertaining to females in technology education. For this discussion I broke the group into two groups. The first group (Group 1) I asked the following question: What can we do with our curriculum or program to attract females? The second group (Group 2) I asked this question: What could we do to make females more comfortable in our programs? Below is a synopsis of the two groups discussions.

Group 1
What can we do with our curriculum or program to attract females?

One of the most common threads of discussion in this conservation is the role that guidance councilors play in influencing students to take technology classes. Many of the technology teachers are discouraging females and higher level students to take technology classes. Another thought is that the curriculum helps promote - or not promote the technology classes. Some classes such as photography are more interesting to females. One teacher argues that is does not matter how much you promote or try and make a class interesting to females. There are going to be classes that attract females and

classes that do not attract females. It is not a matter of promotion - it is a matter of comfort level.

Middle school is another important place that must be used as a promotional piece for high school technology. One idea was to have a career day in the high school that had technology related fields at it. Some teachers feel that because there is so much hands on in the middle school that the females think that is all that is done in the high school.

This group also briefly explored the concept that female technology teachers attracted more female students. The problem with this is that there are only two or three technology teachers that we are aware of and there for we did not have enough data to talk about this further.

Group 2
What could we do to make females more comfortable in our programs?

One of the first item discussed was group dynamics. There is a lack of females in many schools - not just Newark. This lack of females in classes creates other females from not wanting to take technology classes.

Many activities that are done in technology classes are seen as male orientated projects. The question was posed: can activities be made more interesting for females? Some teachers felt that we shouldn't need to change our activities. Some felt that even though many of the classes are traditionally male orientated girls should still want to do them because there is some involvement of the activities in their life. The example that was used was the automotive program. Others quickly dismissed this idea in the group. Another question came up: If you did add female projects to the curriculum how would the males respond? One teacher felt that if you chose the projects carefully you could come up with ones that both males and females would be interested in.

Guidance councilors again were discussed as an important source for promoting the technology program. It was felt that if you attempted to change your programs to be more female oriented, it would take several years for the guidance department to find out about these changes.

Stage 3 - Internet

Review of Current Web Site

This portion of the research did not go as well as I had hoped. I created a web site (part of my local technology educators web page) at www.fourcountyteched.org. The goal was to create an interactive site that also shows a need for action, an example of potential curriculum ideas and, interactive discussions that would happen between educators. Some of the site worked out well such as showing a need for concern and other work that I did. This would include state standards and some examples of what is actually happening in the classroom and an out outline for curriculum. I also attempted to set up a discussion board where there were interactions between educators. This board was hosted by e-groups, a site that provides the ability to hold discussions with other group members. I then promoted this service with my local technology education group. Unfortunately, this particular part of the thesis met with failure. I only had four people sign up with the egroups service and no one participated with the discussion. Because of this I was unable to show a discussion or come up with examples of activities that females orientated. I do not believe, however, that this creates a failure on the part of the thesis. I was still able to gain much information to create a curriculum from my surveys, interviews, my video taped discussion with my local technology group and the Internet.

Review of Current Web Sites Dedicated to this Issue

I discovered two sites that had any baring on this thesis. The first site is the Society of Women Engineers (SWE). "This is a site dedicated to stimulates women to achieve full potential in careers as engineers and leaders, expands the image of the engineering profession as a positive force in improving the quality of life, and demonstrates the value of diversity." The second site, Institute for Women in Trades, Technology and Science (IWTTS), is more dedicated to the assistance of integrating women into technology and law enforcement careers.

The SWE has a large section dedicated to helping educators come up with lessons for females and a guide book to help teachers integrate engineering into the classroom - mainly young females. When reviewing the lessons I really had to question how this helped attract young ladies. They seemed more "male" orientated. I discusses the Aircraft vs. Spacecraft with one of my females in my classes and she said that she did not think she would like doing it. The activities appear to be decent activities, however, there does not seem to be anything that makes them more interesting for females to do. The engineering guide on the other hand has some general ways to promote engineering and some specific ways to help promote females in engineering as well. This is a fantastic resource for engineering teachers.

The IWTTS site is more designed for recruitment. This site provides an excellent resource for those interested in promoting females into non-traditional career tracks. Many of the recommendations from this site are found in this conclusion section of this thesis. One example of this would be creating a recruitment day that includes flyers and guest speakers.

Stage 4 - Curriculum

Discussion of Changes from Old Curriculum

The traditional curriculum was very book based. This means that when a topic

was introduced and needed to be drawn or explored we would assign a page in a book for

the students to work on. The book that we were using was very manufacturing based and

a vast majority of the objects were parts of machinery. In order to make the class more

interesting to students, the emphasis will no longer be on the book when drawing

examples. Instead at the beginning of the year there will be a career unit. Students will

have to select a type of career from a list of drafting/engineering/design categories.

Below is a list of these categories:

- Architecture (this focus will not be on house design but on specific elements in the house)
- Manufacturing - Machine/Mechanical pieces
- Product design - Create things like CD players, Cell Phones
- Auto Design
- Furniture Design
- Interior Design

As we proceed through out the curriculum areas have been identified in the

curriculum that the student will need to design something. These activities are called

Minor Interest Activities. For the mid-term and final the students will do what is called a

Major Interest Activity. For both of these activities students will create/design/draw

something in their area of interest. An example of this will be found in the section

following the curriculum outline. Activities will be from either a predetermined selection

from the teacher or a design of the student that is sketched and approved for the project.

Outline of Curriculum

Unit 1: Overview and Perspective of Design and Problem Solving Process

Section 1 - Introduction to Design and Drawing for Production

Topic 1: Class and Curriculum Expectations

Topic 2: Introduction to Design

Section 2 – Relevancy and Career Opportunities

Topic 1: Career Research

Topic 2: Career Preparation

Section 3 – Evolution of Design

Topic 1: Chronology/Acceleration of Change

Minor Interest Activity

Section 4 – Human, Economic and Environmental Impact

Topic 1: Human

Topic 2: Economics

Topic 3: Ethics

Section 5 - Design Process

Topic 1: Design Process

Topic 2: Principles and Elements of Design

Minor Interest Activity

Section 6 - Student Portfolio

Topic 1: Portfolio Creation

Unit 2: Two Dimensional Drawing/Model Documentation

Section 1 – Documentation Basics (Sketching)

Topic 1: Sketching

Minor Interest Activity

Section 2 – Paper Drafting

Topic 1: Equipment

Topic 2: Scale

Topic 3: Proper Drawing Techniques

Topic 4: Lettering

Topic 5: Geometric Shapes

Minor Interest Activity

Section 3 – 2D CAD

Topic 1: Introduction to AutoCAD/Drawing objects

Topic 2: Snaps

Topic 3: Coordinates

Minor Interest Activity

Topic 4: Drawing Options

Topic 5: Print and Plotting/Title Boarders

Topic 6: Text

Topic 7: Drawing Display Options

Topic 8: Layers & Text Styles

Minor Interest Activity

Topic 9: Dimensioning

Topic 10: Editing Drawings

Topic 11: Copy, Mirror, Array
Section 4 – Orthographic
Topic 1: Orthographic Views
Major Interest Activity
Section 5 – Pictorial
Topic 1: Introduction to Pictorial Views
Topic 2: Isometric
Minor Interest Activity
Unit 3: Product / Model Creation
Section 1 - Manufacturing Processes
Topic 1: Design for Manufacturability
Topic 2: Process Planning
Topic 3: Trends toward Automated Manufacturing
Topic 4: Material Procurement, Handling, and Cost Analysis
Topic 5: Quality Control
Topic 6: Manpower and Facility Requirements
Topic 7: Packaging
Minor Interest Activity
Section 2 - Model/Prototype Creation
Topic 1: Modeling Techniques
Topic 2: Modeling Creation
Minor Interest Activity
Unit 4: Three Dimensional Drawing/Model Documentation
Section 1 – 3D CAD
Topic 1: Sketching
Topic 2: Features
Minor Interest Activity
Topic 3: Assembly
Minor Interest Activity
Topic 4: Presentation
Topic 5: Drawings
Major Interest Activity

Examples of New Curriculum

Career Unit

The career unit will be team taught with the work experience coordinator. There

will be two stages in the career unit. First students will have to research a career in a

chosen field that they are interested. The field must be selected from the list below:

- Architecture (this focus will not be on house design but on specific elements in the house)
- Manufacturing - Machine/Mechanical pieces
- Product design - Create things like CD players, Cell Phones
- Auto Design

- Furniture Design
- Interior Design

Once the field is chosen then a career is selected from this field. The student will then

write a paper including the following topics on their career:

- What is the career?
- What kind of working conditions would you encounter in this career?
- Education necessary
- Salary Range

The second stage would be to create a resume and cover letter. The resume and

cover letter would be written for a potential job in the field the student is interested in.

Students would use the resume wizard in Microsoft Word to complete this task. From this

the students would gain an understanding of objective writing and what is necessary to

include on a resume.

Example of Minor Interest Activity
Below is the outline for part of Unit 4. Notice after Topic 2 it says *Minor Interest*

Activity.

Unit 4: Three Dimensional Drawing/Model Documentation
  Section 1 – 3D CAD
      Topic 1: Sketching
      Topic 2: Features
            Minor Interest Activity

In this particular case the students would go through the lesson of Sketching and

Features. Once a couple of practice exercises are completed the student would then create

an object that would give them some more experience using the Sketching and Features

mode in three dimensional space. This object should be created from a sketch that they

have been working on in previous classes. Below is an example of an object that would

be created if somebody were interested in the furniture field:
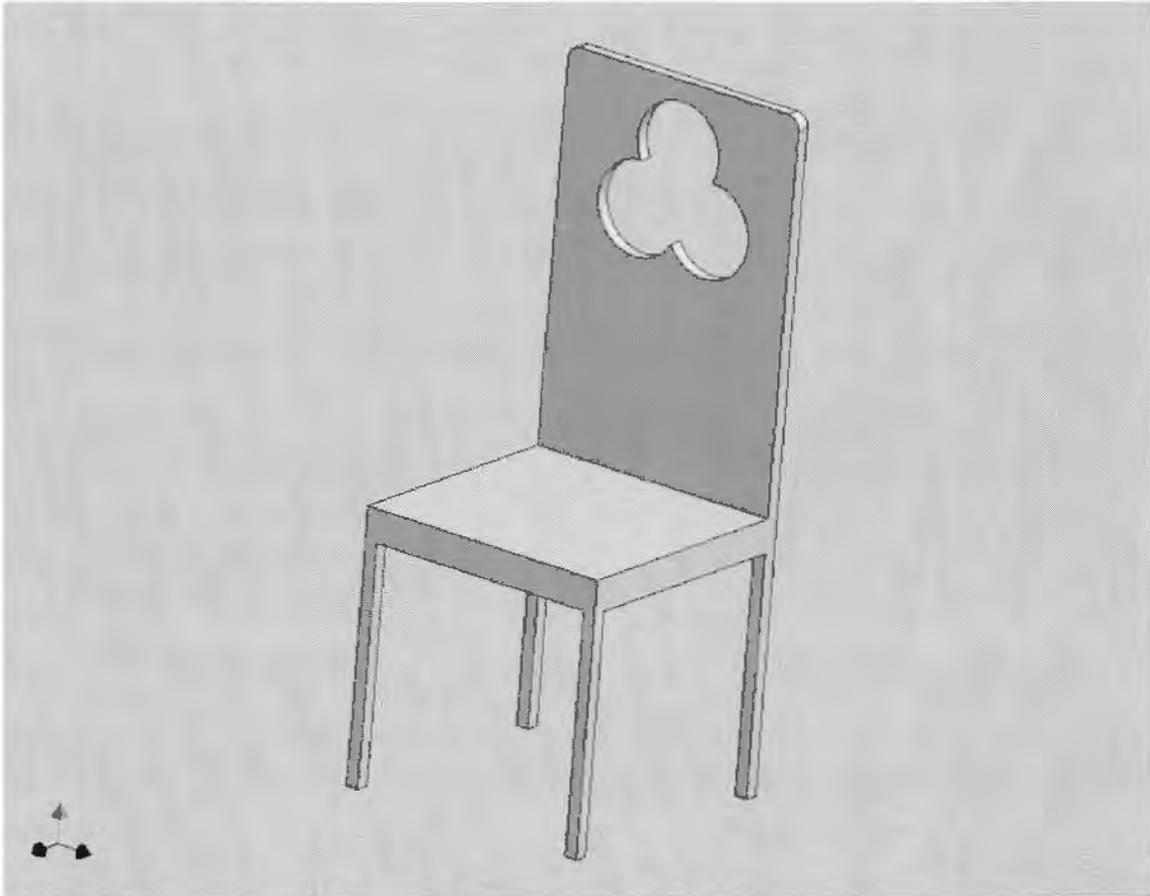
Example of Major Interest Activity

The *Major Interest Activity* is used only twice during the school year - once at mid term and once during the final. The final would be a larger project incorporating the entire year's curriculum. Both projects would be designed and created by the student. Students would start by sketching their ideas out on paper. Once they have finalized the sketches then they could begin to design their products on computer. Below is the specific list of requirements that need to be met in the Final and the Mid-Term:

<u>Mid-Term</u>
- Evolution of Design
- Human, Economic and Environmental Impact
- Design Process
- Sketching
- Paper Drafting

- 2D CAD
- Orthographic

Final
(All the above)
- Pictorial (Isometric)
- Manufacturing Processes
- 3D CAD

Stage 5 - Promotional Package

The one problem that I am going to have with this curriculum is that I will not be able to implement the promotional piece of my thesis until next year. This is because selections for high school classes happened in January. When I initially presented in December, the only concept of promotion I had was to create a poster to distribute in the middle school. The females I did show it to gave me very little feed back usually saying "it's cool". I added a couple more topics on the poster and put in the description at the bottom of the page. This poster will be posted at the beginning of the school year and a small flyer will accompany some of the other promotions discussed below.

My school is very dedicated to implementing an engineering program in the high school. I became part of a committee this year that is designed to help promote this program. One of the classes in the program happen to be the Design and Drawing for Production class that I am focusing on. As a part of this committee we came up with two other promotional ideas. First a video to show students what we are doing in the high school. Second an engineering awareness day would be created. Both of these ideas would have to wait until next year to implement due to how late the committee was formed.

The video would be created by taking clips of the various technology programs and producing an engaging promotional film. The video would be assembled by the Radio/TV class and shown next January in the eighth grade technology classrooms. Along with the video the classes will also get one of the flyers promoting the engineering classes.

The engineering awareness day would happen in both the high school and the middle school. In the middle school there would be a panel of male and female engineers that would go into the eighth grade classrooms and have a discussion about the engineering field. In the high school we would have a similar panel of engineers that would be available to come in to the math classes and after school. For both of these promotions a flyer will be included to help advocate the engineering program.

From the discussions I group I had with my other technology teacher I discovered that I needed to create one other promotional piece. This promotion piece is a guidance awareness day. The biggest advocate technology teachers (any elective for that matter) have are guidance councilors. If guidance councilors are not aware of your program then they will not properly place students into your classes. A recommendation would be to create an in-depth presentation of your technology program. Once this is created have a snack and refreshment period for the guidance councilors. During this period you run the presentation to give them a better idea of what your program is all about.

Conclusion

In an attempt to *enlist the aid of female students, and area technology teachers in envisioning a gender-inclusive technology curriculum beginning with a redesigning of the first high-school technology course, Design and Drawing for Production* I have discovered many things. First of all, out of all of the females I surveyed about half of them had no interest in taking technology education. A majority of the females gave no reason why they did not want to take technology classes. The few that gave a reason seemed to not know what technology was about or had misconceptions about technology classes. Of the females that were interested in technology many of them as well shared many of the same misconceptions that the previous females had. The most popular misconception was that all technology classes are based on making things. I was also able to discover many of the things that females would be interested in designing throughout this survey. The three most popular things to design being: Houses/Buildings, Interior Decorating/Furniture and Automobiles/Vehicles.

I was also fortunate to be able to have two large group discussions with other technology teachers about the lack of females in technology education. From this I found that many of the teachers placed blame on guidance for not persuading females in taking technology classes. Some other technology teachers also felt that females would not take technology classes no matter what type of promotion you attempted. Another group heavily discussed what activities (if any) you could include in your curriculum to be more enticing for females. There were no specific activities that were identified but it was generally felt that ones could be designed.

I also attempted a unique way of reaching out to the world for this thesis. I created a web page and tried to come up with a way to get feedback from teachers (and others for

that matter) on the topic of young females in technology education. What I wanted to do was create a page that was interactive. Unfortunately, at this time I lack the skills to create such a site. Instead I enlisted the help of a site called egroups. This site allows people to come together and interact with each other. Despite my best efforts to promote it through my technology association no one participated in any of the discussions. This particular site requires you to sign up in order to use it and I believe that many of the people were turned away by this feature. One of my future goals that have stemmed from this project is to create an interactive web page that deals with many different topics relevant to technology education - one of them being females in technology.

As a result of these research techniques I created a redesigned curriculum that attempts to be more appealing for females (actually it is flexible enough to appeal to anyone). The original curriculum focused on teaching the basics necessary to become proficient at drafting and engineering. This was traditionally done by giving a lesson and following up that with a couple of drawings out of a textbook. The new curriculum still teaches the basics that are necessary. The changes come in the activities that follow the lessons. Instead of the activities being assigned out of a book the students create realistic products out of a field that interest them. They choose this field in the beginning of the year during a career unit. I am also fortunate because I will be able to implement this new curriculum next year into my Design and Drawing for Production class.

The final thing that is necessary to make the curriculum a success is to promote it so that females are interested in taking the course. Unfortunately, I will not be able to promote this course in time for next year's new curriculum infusion. This is not necessarily a bad thing because it gives me one year to work with the new course to

improve it before I promote it. One of the original ways I came up with to promote the program was to create an exciting flyer that would attract females. During the last couple of months my school created a committee to help promote the engineering program in my school. This committee, which I am on, came up with two additional concepts to help promote this class. The first concept is to create a video that promotes the technology program. This video would be shown in the eighth grade to help promote the high-school technology program. The second idea would be to create an engineering day that would bring male and female engineers into the middle school and high school to help promote engineering. These ideas are to be implemented before next years class sign up.

Appendix
Appendix A: Eighth Grade Middle School Females Survey

Instructions: Please read each of the questions carefully and respond as best as you can. All responses will be kept confidential and shared only in an educational setting.

1. What is your Name? (Optional) _____

2. How old are you? _____

3. List some of your hobbies: _____

4. How do you feel about technology education? _____

_____

5. Do you think you are going to take technology education next year? _____

6. If you are going to take technology education next year what made you want to do this?

_____

_____

6. If you are not going to take technology education next year what made you not want to take technology education.

_____

_____

7. Who in your life most influences your decisions? _____

8. What activities would interest you in a drawing/drafting course (what would you like to design/create)?_____

_____

Please circle the following answer as best as possible

Who do you think is better at technology?	Girls	Boys	Both
Who do you think is better at science?	Girls	Boys	Both

Appendix B: High School Females That Have Not Taken Technology Education Survey

Instructions: Please read each of the questions carefully and respond as best as you can. All responses will be kept confidential and shared only in an educational setting.

1. What is your Name? (Optional) _____

2. How old are you? _____

3. List some of your hobbies: _____

4. How do you feel about technology education? _____

_____

5. Why did you not take technology education this year? _____

_____

6. Who in your life most influences your decisions? _____

7. What activities would interest you in a drawing/drafting course (what would you like to design/create)? _____

_____

Please circle the following answer as best as possible

Who do you think is better at technology?	Girls	Boys	Both
Who do you think is better at science?	Girls	Boys	Both

Appendix C: High School Females That Have Taken Technology Education Survey/Interview
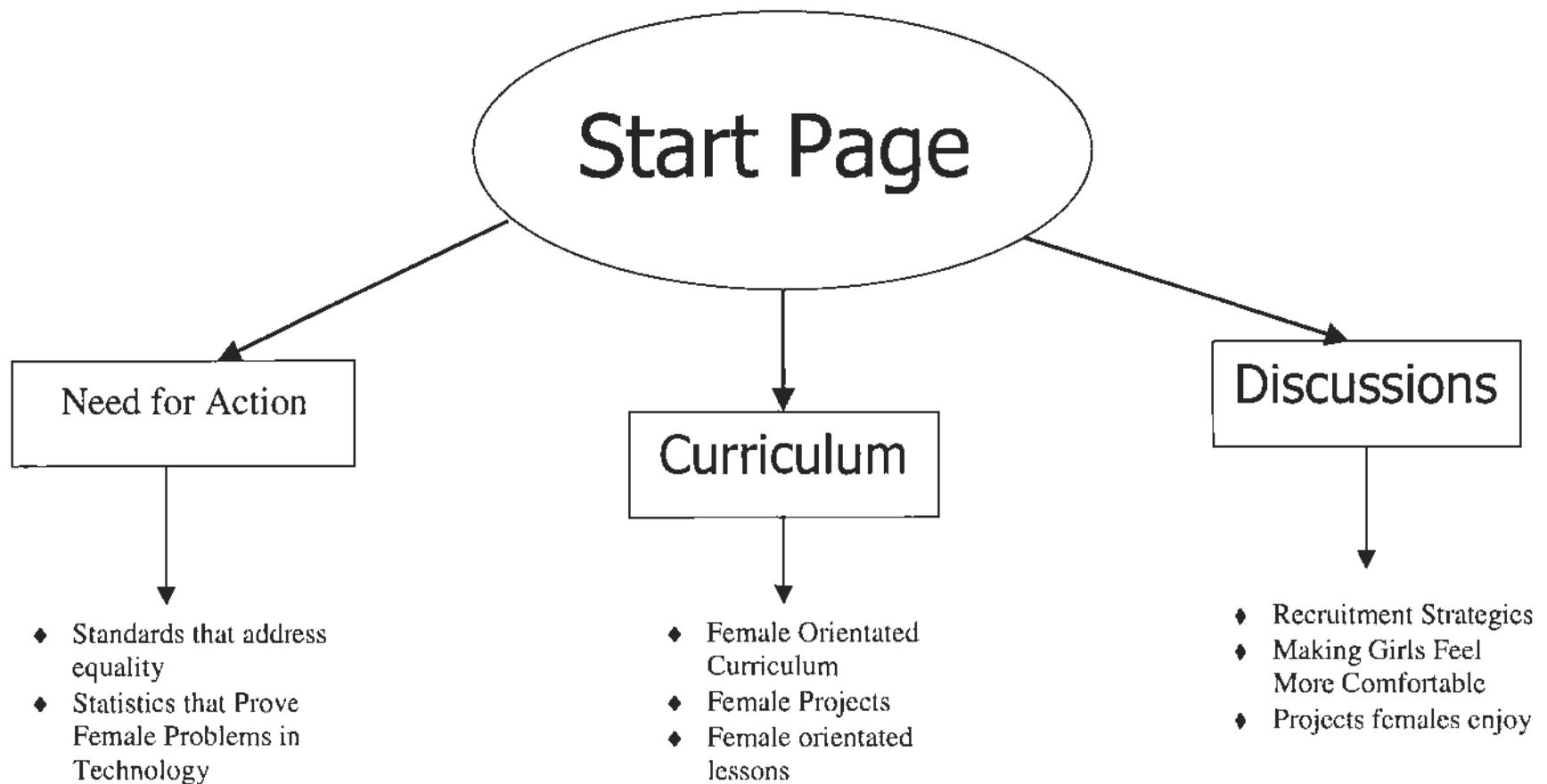
Instructions: Please read each of the questions carefully and respond as best as you can. All responses will be kept confidential and shared only in an educational setting.

1. What is your Name? (Optional) _____

2. How old are you? _____

3. List some of your hobbies: _____

4. How do you feel about technology education? _____

   _____

5. What made you choose to take technology education this year? _____

   _____

6. Who in your life most influences your decisions? _____

7. What activities would you like to see in your drawing/drafting course (what would you like to design/create)?_____

   _____

Please circle the following answer as best as possible

Who do you think is better at technology?	Girls	Boys	Both
Who do you think is better at science?	Girls	Boys	Both

Appendix D: Web Page Map/Outline

Start Page

Need for Action

Curriculum

Discussions

- Standards that address equality
- Statistics that Prove Female Problems in Technology

- Female Orientated Curriculum
- Female Projects
- Female orientated lessons

- Recruitment Strategies
- Making Girls Feel More Comfortable
- Projects females enjoy

Appendix E: Example of Promotional Poster

Welcome to the world of Engineering!!
Newark High School offers a entire line of design courses in the high school.
The first class necessary to begin the design cycle is Design and Drawing for Production.
In DDP you can identify a career area that interest you and design products from this field.
Some examples of careers that you could explore would be:
Architecture, Interior Design, Product Development, and Furnature Design
If you have further questions you can ask your technology teacher or E-Mail Mr. Brewer at:
ebrewer@newark.k12.ny.us

Appendix F - Time Line

End of December 2000

       Outline of Revised Curriculum – First Revision

       Proposal

Middle of January 2001

       Female issues discussion at Four County Technology Education Meeting.

       Surveys distributed at Four County meeting – Surveys must be returned with in two weeks.

       Launch of web site

Beginning of February 2001

       Surveying/Interviewing Adolescent Females

End of February 2001

       Second revision of curriculum done as a result of surveys and discussions.

       Curriculum placed on web page for critique

Middle of April 2001

       Final revision of curriculum completed as a result of critiques and discussions on web page.

End of April 2001

       Promotional package created to attract more students

       Promotional package critiqued by females in Newark High School and revisions created as a result.

May 2001 – Beyond

       Web site continued as a means of communication between technology teachers.

Appendix G – Old Curriculum Outline

This Curriculum was created for the initial presentation in December
See the new curriculum on the conclusion section of the paper

Unit 1: Relevancy of Design and Career Opportunities

Section 1 – What is design?
Topic 1: Introduction to Design

Section 2: Career/Major Interest
Topic 1: Career Research
Topic 2:Career Preparation

Unit 2: Overview and Perspective of Design and Problem Solving Process

Section 1: Evolution of Design
Topic 1: Chronology/Acceleration of Change

Section 3: Human, Economic and Environmental Impact
Topic 1: Human/Economic/Ethics

Section 4: Product/Project Development
Topic 1: Product/Project Development

Unit 3: Drawing/Model Documentation

Section 1: Documentation Basics (Sketching)
Topic 1: Sketching

Section 2: Paper Drafting
Topic 1:Equiptment
Topic 2:Proper Drawing Techniques
Topic 3: Geometric Shapes

Section 3:2D Cad
Topic 1:Introduction to AutoCAD
Topic 2:Drawing Objects
Topic 3:Drawing Option
Topic 4:Setting up Drawings
Topic 5: Printing & Plotting and Title Borders
Topic 6:Text
Topic 7: Drawing Display Options
Topic 8: Layers & Text Styles
Topic 9: Dimensioning
Topic 10: Editing your Drawing
Topic 11: Copy, Mirror, Array

Section 4: 3D CAD
Topic 1:Sketching
Topic 2:Features
Topic 3:Assembly
Topic 4:Presentation
Topic 5:Drawings

Appendix H – Email Responce

Subject: stats
Date: Thu, 19 Oct 2000 15:33:33 -0400
From: "Tonya Davis" <tdavis@womenwork.org>
To: <e_brewer@interaegis.com>

Hello Eric:

Sorry about the delay in responding to you. My computer crashed and its been quite the process recovering mail and what not. I'm afraid I don't have much that can assist you on drafting and engineering specifically. In general, it is difficult to recruit women for occupations that are nontraditional for their gender. One of the difficulties is in recognizing this is a viable field for them. Often, having a female role model helps. This can be an actual person who speaks at recruiting fairs, enrollment sessions, and like forums. Or you can utilize posters showing female drafters/engineers or other props in your program materials and office. Sometimes, it can be an issue of harassment, if a woman doesn't feel she would be welcome in the training and work environment or has heard of someone else having a negative experience.
Sometimes its a lack of knowledge, i.e. not recognizing drafting/engineering as a career option. Again, role models help, as does highlighting the skills necessary to succeed in the field and demonstrating that they are not strictly male attributes. You may want to check out our publication, Jobs That Pay! for further suggestions. Additionally, I would recommend you check out IWITTS and WOW's websites.

Let me know if you have additional questions.
Tonya

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