

TEACHER QUEST TAMPA BAY PROGRAM

ACTION PLAN

Author: Donna Winstead
Lesson Title: Paper Cartridge Production
Grade Level: Middle School
Subject Areas: Math
Date: July 22, 2010

Summer Work Experience

My Teacher Quest externship as a Manufacturing/Technical Intern at Sun Hydraulics has been a very rewarding experience. My duties as a technical intern took me on a tour of the company that exposed me to multiple aspects of the design and manufacturing process of screw-in cartridge valves and manifolds used for mobile and industrial markets. I was able to follow the manufacturing process from raw material to finished product and had experience working in lathe, honing, grind, laser, solenoid, assembly, test, shipping, customer service, cell cartridge, and manifold. My primary responsibilities included making precision parts for cartridges manufactured to the millionth of an inch and the assembly of the cartridges.

The majority of employment opportunities at Sun Hydraulics are in the areas of engineering and manufacturing and the company is looking for individuals with the following characteristics: keen-decision making skills, the ability to self-manage, strong computer skills, general business knowledge, and the ability to work within a team environment. Sun Hydraulics has a commitment to excellence and expects all of its products to function accurately and reliably. In order to achieve this goal all employees must be detail oriented and focused on producing quality parts in a timely manner. Attention to detail and precision are a part of each manufacturing area along with multiple quality control checks, accountability and pride. The work environment is unique because there is no hierarchy, no job titles, no formal job descriptions, and no organizational charts or departments. All offices and work areas are open to one another to promote communication.

Changes that I hope to implement in my classroom based on this work experience are as follows. First off, I plan to use cooperative groups in math to foster the ability to work in a team environment. All students will be expected to work cooperatively and be cordial to one another. I plan to rotate groups frequently (every 4-5 weeks) in order for students to establish new working

relationships and to learn that it is possible to work with whom ever they are assigned. At Sun employees are expected to be able to work within a team environment and employees are shifted from one area to another based on need.

Secondly, I plan to return to using caddies for supplies. I like to keep supplies available for student use such as pencils, highlighters, and rulers. This time however, I plan to hold students more accountable for the care and organization of these materials. At Sun Hydraulics all materials are organized by a number code system and employees have available to them all of the resources they need to do their job. Each employee is expected to maintain their supplies and keep their work areas clean and organized for the next shift. Additionally, co-workers sign off on quality checks for each other and I plan to have my students do the same. Each table will have a weekly checklist and one student will have to check off that all supplies are present and that no books or desks have been drawn on. Then a table mate will have to verify that this information is correct and initial next to their teammate's initials. This will be done for each class.

At Sun, highlighters are available to all employees to help them keep track of their work and emphasize important points on assembly and outline drawings of cartridges. I have used highlighters in my classroom but want to make it a more common practice for students to use them to highlight important directions, key terms and answers. I believe that good practices in the workplace should be mirrored and taught in the classroom.

In an information product/company seminar, the company provided employees with folders that included definitions for broad terms and processes that apply to their manufacturing process. The vocabulary is technical and it is necessary for all employees to understand these terms so that everyone can communicate efficiently. In my classroom I pre-teach vocabulary and have word walls but not enough space to keep up all vocabulary words for my classes for the year. Next year I would like to keep a resource folder on each desk and model it after Sun's concept. It would be wonderful to have vocabulary broken down by topic and examples of mathematical terms and processes for each chapter. Math builds on skills that have been previously learned and having reference folders available for each class that I am teaching would be a great resource. Students will have this information in their note books but there is nothing like a quick reference guide.

Lastly, I would like to develop a new poster which lists desired skills for math students. This list will be modeled after a company's job posting of desired skills for potential employees. My "Top Ten list of desired Skills for Math Students" mirrors what skills I have seen portrayed during my internship. My "Top Ten" List is as follows:

1. Have a good attitude. (Attitude is Everything)
2. Be detail oriented. (Read carefully and show all work)

3. Follow directions and procedures carefully.
4. Be a good listener.
5. Ask questions when you don't understand something.
6. Be a self-starter and have the ability to work independently.
7. Show respect for everyone.
8. Take pride in your work.
(Neatness counts. Use your full first and last name on assignments)
9. Be a team player. Give help to others freely and be willing to work with others.
10. Be responsible. Do your homework and class assignments on time and come to class prepared.

I want my classroom to continue to be a warm caring environment where everyone enjoys working. I want my students to be motivated and to understand what goals they are working towards. At Sun, employees are taught to think quality first not quantity. I want to stress to my students that the quality of their end products is everything and that with time and practice the quantity of their work will increase. Not only is it important for my students to become fluent in math but I also want them to be consistent in their skills. I want my students to be problem solvers and to think outside the box. I want them to show initiative and to come up with innovative ways to solve problems.

After working this summer at Sun Hydraulics and Representing Tampa Bay Teacher Quest I want to implement more project-based learning tasks and highlight the benefits of math and how math is used in different jobs and projects world wide.

Lesson Plan: Computation and Measurement

Objectives

Students will use technical drawings to build a paper cartridge and ensure that it will pass quality control testing. Students will analyze drawings of a body and sleeve and make standard measurements to the nearest whole, half, quarter, eighth, and sixteenth of an inch.

Sunshine State Standards

MA.7.A.3.2: Add, subtract, multiply, and divide integers, fractions, and terminating decimals, and perform exponential operations with rational bases and whole number exponents including solving problems in everyday contexts.

MA.6.A.5.3: Estimate the results of computations with fractions, decimals, and percents, and judge the reasonableness of the results.

MA.6.A.5.1: Use equivalent forms of fractions, decimals, and percents to solve problems.

MA.6.A.5.2: Compare and order fractions, decimals, and percents, including finding their approximate location on a number line.

Materials

Assembly and outline drawings for a paper cartridge, pencils, scissors, hand held hole punch, ruler, safety compass, protractor, clear tape, light colored heavy weigh paper or construction paper, round coffee stirs

Instructional Procedures

1. Have students complete the following prompt “It is important to study math because ...”. Discuss their views on why math is important and ask them to brainstorm a list of jobs that use math on a daily basis. Share with students your personal experiences. I will discuss my summer internship with Sun Hydraulics and provide them with basic information on the usefulness of hydraulic power. They will then be given background information on cartridges and manifolds and how these products help power hydraulic devices.
2. Students will take a pre-employment test of basic math and reading comprehension skills before being hired on in class to work on the floor constructing paper cartridges.
3. Students will review standard units of measurement and use rulers to practice measuring to the nearest whole, half, quarter, eighth, and sixteenth of an inch.
3. Students will be taught how to read and interpret assembly and outline drawings. They will be shown examples of drawings used to build actual bodies and sleeves for hydraulic cartridges. Dimension tolerances will be discussed and it will be explained why the cartridges are manufactured to the thousandth of an inch.
4. Students will be given assembly drawings for a paper body and sleeve, an outline drawing of a paper cartridge, and all necessary tools needed to produce this product. Students will then work both cooperatively and independently to create their cartridge.
5. Students will test their final product with coffee stirs to make sure that all holes on their cartridge line up precisely and write a reflection.

Integration of Summer Work Experience/Follow-up Activities:

This project was inspired by my summer work experience. As a follow up activity students will be doing research projects on careers that utilize math and creating information posters on how math is used in everyday life. These posters will be based on the skills learned in each chapter of their text which follow the Sunshine State Standards. Additionally, I would invite a guest speaker from Sun Hydraulics to come into the classroom and talk about the skills and qualities they are looking for in employees and the importance of math and science to their final product. I would like for them to bring a sample of a cartridge and manifold to be passed around the classroom and show students a micrometer and caliper and how they are used to measure.

Assessment Instrument

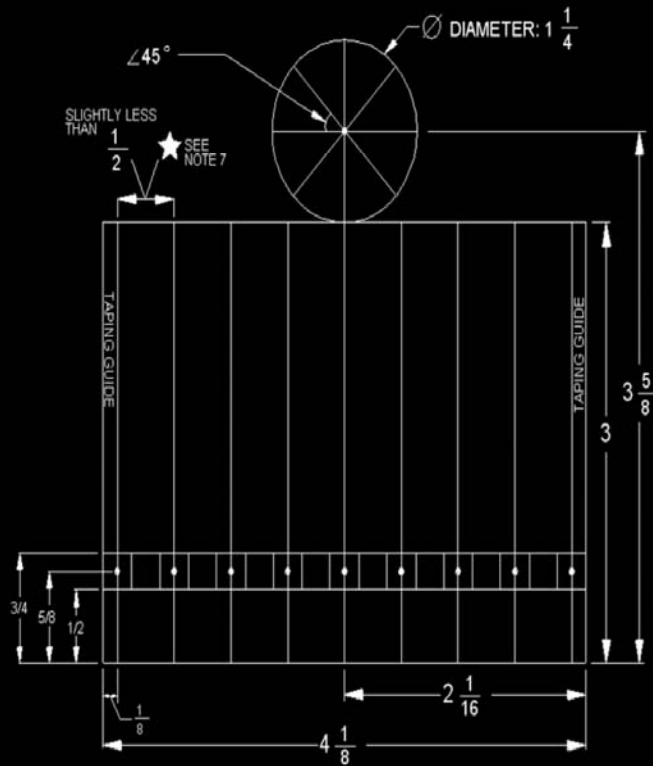
The student's final product will act as an assessment instrument. If they constructed their cartridge precisely it will pass the testing requirement printed on their outline drawing. Students will then be asked to create a simple assembly drawing of a 3-dimensional figure that could be built in class. Examples of possible drawings (either a template or net) could be a cube, prism, pyramid or any other polyhedron such as a dodecagon. In addition, students will be asked to write a reflection about their experience.

Comments

After working this summer I will continue to stress to my students the importance of attitude and quality of work. I will also be making some basic changes that relate to classroom expectations as cited in my summer work experience. Lastly, I have included the drawings necessary for this activity. These drawings were created with visual CAD.

Note: There are separate .pdf files available so that the drawings can be printed out with a white background and black ink for printing or copying purposes.

OUTER BODY



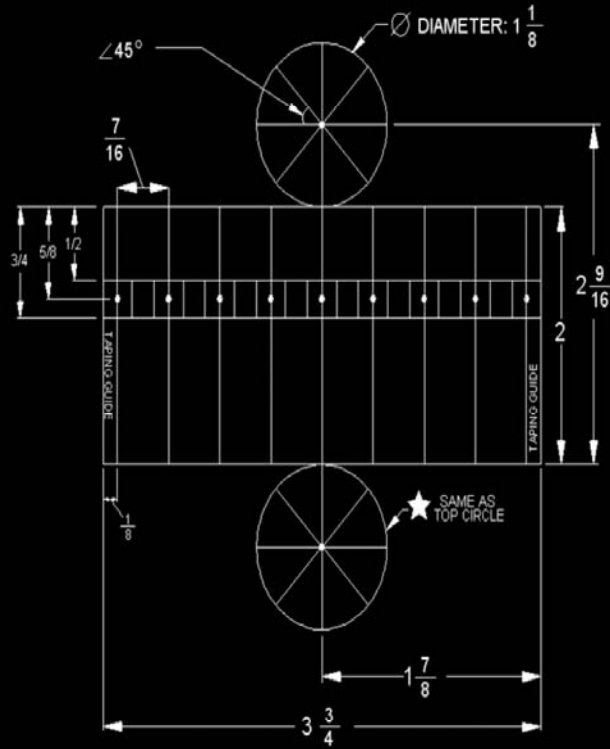
NOTES:

- 1) DRAW CENTER POINT ON LID.
- 2) CONSTRUCT CIRCULAR LID WITH SAFETY COMPASS USING CENTER POINT. DRAW ANGLED LINES ON LID.
- 3) DRAW TOP EDGE OF CYLINDER FROM CENTER LINE OUT ON BOTH SIDES. VERIFY OVERALL LENGTH.
- 4) DRAW CENTER CENTER LINE TO SPECIFIED DISTANCE.
- 5) DRAW BOTTOM EDGE OF CYLINDER FROM CENTER LINE OUT ON BOTH SIDES.
- 6) CONNECT SIDES AND SKETCH ACCORDING TO THE DIAGRAM.
- 7) VERTICAL LINES MUST BE MEASURED FROM CENTER LINE OUT.
- 8) BE CAREFUL NOT TO CUT OFF CIRCULAR TOP WHEN CUTTING OUT BODY.
- 9) WHEN ASSEMBLING BODY, TAPE CYLINDER CLOSED FIRST BEFORE TAPING DOWN LID.
- 10) WHEN TAPING DOWN LID, PUT A SMALL PIECE OF TAPE ON END OF LID AND FOLD DOWN OVER THE BODY. BE SURE TO MATCH UP THE LINES.
- 11) ONCE TAPED TOGETHER, USE HAND-HELD HOLE PUNCH TO CENTER A HOLE IN EACH GUIDE SQUARE.

				 TITLE ASSEMBLY - MRS. WINSTEAD'S PAPER CARTRIDGE			PART NO. PAPER CARTRIDGE		
				DIMENSION TOL ± 0.005 ANGLE TOL $\pm 1'$ ALL DIMENSIONS MADE IN INCHES	SCALE 1:1	REF SERIES 1	MATERIAL		
				DRAWN MJR	CHECK DJW	RELEASE *	SHEET 1 OF 2		
				DATE 20JUL10	DATE 20JUL10	DATE *	 Donna Winstead Michael Rzonca		
LTR	REVISION	DATE	DRN	CHK	REL				

PART NO.
PAPER CARTRIDGE

INNER SLEEVE

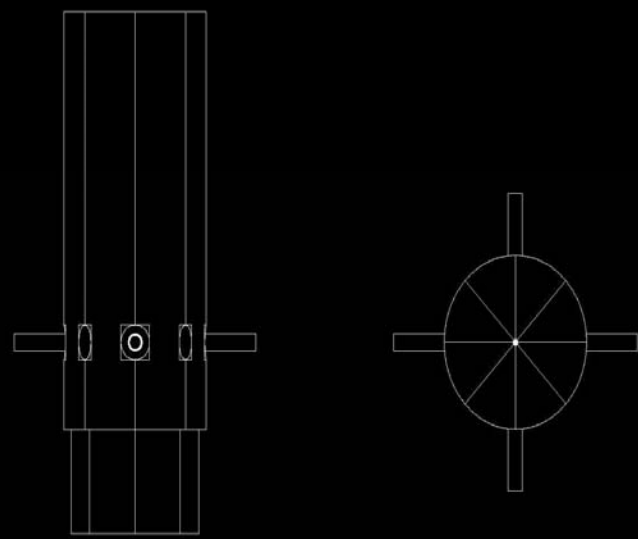


NOTES

- 1) DRAW CENTER POINT ON LID.
- 2) CONSTRUCT CIRCULAR LID WITH SAFETY COMPASS USING CENTER POINT. DRAW ANGLED LINES ON LID.
- 3) DRAW TOP EDGE OF CYLINDER FROM CENTER LINE OUT ON BOTH SIDES. VERIFY OVERALL LENGTH.
- 4) DRAW CENTER LINE TO CENTER POINT OF BOTTOM CIRCLE. CONSTRUCT BOTTOM CIRCLE AND DRAW ANGLED LINES.
- 5) DRAW BOTTOM EDGE OF CYLINDER FROM CENTER LINE OUT ON BOTH SIDES.
- 6) CONNECT SIDES AND SKETCH ACCORDING TO THE DIAGRAM.
- 7) VERTICAL LINES MUST BE MEASURED FROM CENTER LINE OUT.
- 8) BE CAREFUL NOT TO CUT OFF CIRCULAR LIDS WHEN CUTTING OUT BODY.
- 9) WHEN ASSEMBLING BODY, TAPE CYLINDER CLOSED FIRST BEFORE TAPING DOWN LID.
- 10) HOLE PUNCH BEFORE SECURING LIDS.
- 11) WHEN TAPING DOWN LIDS, PUT A SMALL PIECE OF TAPE ON END OF EACH LID AND FOLD DOWN OVER THE BODY. BE SURE TO MATCH UP THE LINES.

					TITLE ASSEMBLY - MRS. WINSTEAD'S PAPER CARTRIDGE			PART NO. PAPER CARTRIDGE		
					SCALE 1:1	REF SERIES 1		MATERIAL		
					DRAWN MJR	CHECK DJW	RELEASE *	SHEET 2 OF 2		
					DATE 20JUL10	DATE 20JUL10	DATE *	 		
LTR.	REVISION	DATE	DRN	CHK	REL				Donna Winstead Michael Rzonca	

PART NO.
PAPER CARTRIDGE



★ NOTE: IN ORDER FOR THIS CARTRIDGE TO PASS TESTING, TWO STRAWS MUST INTERSECT AT A 90° ANGLE AND HOLD SHAPE. THIS PROVES ALL MEASUREMENTS ARE ACCURATE AND ALL HOLES ARE ALIGNED AS SHOWN ABOVE.

						TITLE: MRS. WINSTEAD'S PAPER CARTRIDGE REVISION: PAPER CARTRIDGE	
				DIMENSION TOL: $\pm \frac{1}{16}$	SCALE: 1:1	REF: SERIES 1	
				ANGLE TOL: +/-	DRAWN: MJR	CHECK: DJW	RELEASE: *
				ALL MEASUREMENTS MADE IN INCHES	DATE: 20JUL10	DATE: 20JUL10	DATE: *
LTR	REVISION	DATE	DRN	CHK	REL		
						Donna Winstead	Michael Rzonca