



Middle & High School Field Trips to Florida High Technology Manufacturing Facilities *a FLATE Best Practices Guide* www.fl-ate.org



Connecting students and educators to their industry partners.

FLATE

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Let's go

If you'd like to take a group of school kids on a field trip to a local industrial facility, with a minimum amount of hassle, this material will give you a "heads-up" look at all of the details which need to be thought about, covered, or dismissed (depending upon your school and individual needs).

Since 2005, we've conducted over 150 tours to more than 50 different manufacturing sites, introducing around 3,000 students and 300 educators to the world of modern manufacturing. We don't have all the answers, but we've had our share of learning opportunities and would like to share what we've learned with you. This guide is about manufacturing tours, but the same principles will apply to most if not all field trips to industry and commercial locations. We hope it will help your tour be as successful as possible with the minimum amount of bumps along the road (no pun intended). We look forward to hearing your feedback and ideas about the materials in this guide and your experience using them.

"The tours underline the importance of science, technology, engineering and mathematics (STEM), and its relevance/applicability outside the classroom, and give students an in-depth overview of high-tech careers and an exploration of post-secondary educational requirements to qualify for these jobs." Dave Gula, Outreach Manager

Learn more about FLATE and our *Made in Florida* outreach campaign at: www.fl-ate.org and www.madeinflorida.org

Please contact us at: 813.259.6581 or outreach@fl-ate.org.

Special thanks to our generous hosts; our program would not be a success without them.

A few quotes from our industry partners about FLATE's *Made in Florida* Industry Tours and programs observe:

"The tours have been an essential factor in showcasing the integration of various skill-sets in a manufacturing facility, intricacies of manufacturing processes, and how everything is inter-connected. The MIF [Made in Florida] tours have also served as a vehicle in underlining the importance of science, technology, mathematics, and engineering in securing high-wage, high-skill jobs." Valpak

"Education is the key to being able to work in an exciting industry such as aerospace. Focusing on STEM and continuing college education will give students a competitive edge in securing next generation, high-tech jobs." Pratt & Whitney Rocketdyne

"The Made in Florida outreach campaign has been an effective vehicle in enhancing technology education, and giving students an opportunity to develop a passion for technology." EEI Manufacturing Services

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The overall goal

FLATE, the Florida Advanced Technological Education Regional Center of Excellence, was established by the National Science Foundation (NSF) in 2004 to help develop a skilled and qualified workforce for Florida's manufacturers, and our high-tech industry tour program is part of our outreach effort. The goal of this particular project is to introduce middle and high school students in grades 7 through 12 to the work of modern manufacturing in facilities using advanced technologies, provide opportunities for direct contact with the people in the plants, stimulate student interest in the wide variety of supporting technical careers, and encourage enrollment in the essential technology programs available throughout the state of Florida.

An important objective for the tours is to raise student awareness and promote a positive image about careers in modern manufacturing in Florida. In a comparison study of student attitude change using a post tour survey, 78% of the students either 'Agreed' or 'Strongly Agreed' that the tour was helpful to their understanding of jobs and careers options. In addition, 88% 'Agreed' or 'Strongly Agreed' that they wanted a high skill, high-wage position.

Finding the right place

Where to go will be the most time consuming part of the entire adventure ... finding a location whose processes and products match what you would like the students to experience. You will want to confirm that the manufacturing processes are high tech, and there is a lot of activity that will be exciting for students to see. Example: Connecting human actions and programming with real robots at work on the factory floor = exciting. Is the experience aligned to the curriculum you are teaching back in the classroom, or an activity you plan to implement? (FLATE has print and online-ready resources for you if needed). Places to get help in this treasure hunt are regional manufacturing organizations, engineering societies, economic development councils and local chambers of commerce. When cruising for locations, we limit our sites to within 75 miles of the school so that a round trip, including about 1 ½ hours in the facility (to make it cost effective), usually takes no more than 5 hours. Of course, stopping for lunch will add to the overall time, but that is up to the teacher.

To convince a facility to consider allowing tours, we've learned to stress the benefits of hosting a tour. Hosting school tours provides the facility with an opportunity for community service and positive public relations. The tour may provide an opportunity for outreach that can help establish a partnership with schools offering aligned technical programs, and showcases the business to students as future potential employees. In our follow up surveys with industry partners, 81% responded that tour was a good use of company time and

resources and 19% somewhat agreed. Once your location has been selected, you have several options on how to get the group to the site and back.

Getting there

Now that you've selected the location, how will you get there? Local bus/limousine services available in your area can be found either in the Yellow Pages or on the internet (funding discussed later). Most charge from the time they leave their facility to the time they get back, usually by the hour. Before selecting one of these, you need to check with your school district's department that keeps up with approved vendors. They will know which ones have the appropriate vehicles, insurance coverage, and have complied with the Jessica Lunsford Act requirements. Second, you could try using school district buses or even multi-passenger vans if the group is small enough. One problem that could occur here is the limited time they are available during the day to do this type of service. Finally, there is always private car-pooling. Again, check with the school district to see if this is allowed as the tour would probably be considered a school function.

We rely on MapQuest to get directions for those going ahead of the group (usually the coordinator) and sometimes the drivers. Although most know where they have to go and may be equipped with global positioning system (GPS) devices, so play it safe and hand out maps. Also exchange phone numbers with the driver, teachers, and facility representative in case of emergency.

Funding your field trip

There are several areas of funding that may be used for various tour expenses. We have received funds from state organizations, donations from several regional manufacturing organizations (who have also helped in establishing some of the tours), educational foundations, local companies, and our own NSF grant funding.

EXPENSES

In order to make it easier for the teacher to 'sell' a tour to administration for her students, we have eliminated as many financial barriers as possible. Our funds cover:

- the bus expense itself, which usually starts in the \$400.00 range for a five hour trip
- a substitute teacher's expense to the school/district, which may be required depending on several school and district factors

- a teacher's aide expense to the school/district, which may be required by school district field trip protocol

Although we handle the transportation invoice directly with the company, we ask the school or district to invoice us for the substitute teacher and teacher's aide expenses, if any, after the tour is over.

Depending upon the time of day for the return trip, numerous schools have opted to stop along the way back to school for lunch. This food expense is not covered by us. However, it does add to the travel time, which is on our tab.

What to expect during the trip

What students will hear

First, ask the facility tour guide or team to provide an orientation for your group. Some facilities may have a formal PowerPoint or video which they typically show, but an informal short speech letting students know about the facility and its products, processes, and personnel is also effective. You may wish to offer some guidance for this orientation, especially if your chosen facility personnel are excited about the tour, but inexperienced with school groups.

TIPS:

- Offer a short overview of the company: what it makes, and how it makes and markets its products
- Have some sample items and/or parts to show, and ask some questions about them
- Make it relevant to students - if the product is not something they personally use, identify an analogous product
- Ask questions about the product such as:
 - Could we make this out of another material, why or why not?
 - What effect would a change in size/tolerance have on the product?
- Explore the careers/pathways for this industry. What kind of education is needed? What STEM subject background prepares a student for these careers? How much money can employees make (especially important for high school students)

Students may be divided into groups of 10 or so and taken throughout the plant by management, human resource, or other trained personnel explaining what is going on along the way, however, the optimum group number is 4-5 to ensure that everyone can hear. Some locations are inherently noisy; you can prepare students for this ahead of time by explaining what they will see and hear at a particular place or section on the shop floor. Often the tour staff will address the group after the tour for a question and answer session. And of course, give-aways from the host or tour coordinator are always popular.

What students will see

We strongly suggest a pre-tour visit of the site in order to give you an idea of what the students will see. Look at it through their eyes. Check how long it takes you to make the walk through (could you be in and out in 20 minutes?) in addition to any introduction management may want to give. We have been in many high-tech operations which produce some outstanding products, many of which you can't see because of environmental barriers on the floor or due to areas in the plant not open to the public. This is done to either protect proprietary parts in the manufacturing process, the equipment used to make them, or because they are a defense contractor (everyone will need to have Legal US Residency to be allowed in). Through experience, the younger the group, the more activity the better...they are magnetically attracted to automated robotic lights and action. Although adults may be impressed, explaining what is going on inside a really expensive piece of equipment that looks like a small gray Winnebago will not hold students' attention for very long.

Safety equipment and facility rules

SAFETY GLASSES/EAR PLUGS/CLOTHING

So far, every location we have visited that requires eye and ear protection on the shop floor has provided the proper SAFETY GLASSES (regardless if they wear glasses or not) and EAR PROTECTION to anyone going through the shop door. Although we have some spares, various plants have different requirements and prefer to supply their approved OSHA items. It will require your vigilance to see that they stay on and in the proper place.

Also, due to OSHA requirements, just make it understood that all students will wear the proper enclosed foot wear, which means no high heels, open-toes or open-heels. Long, loose hair should be contained, and many places also require the legs to be covered and no open midriff blouses...keep it covered neck to ankles.

ABOUT PHONES/CAMERAS/FLASH MEMORY DEVICES

Many locations today will not allow photography equipment within the manufacturing facility for numerous reasons, all of which must be complied with. Today, just about every cell phone has a camera so those would not be allowed either. If it is a defense contractor, in addition to no phones, no recording devices of any type (memory sticks, etc) are allowed. These are all best left on the bus or at the Security Desk. They will be taken away from students and teachers if discovered.

To save embarrassment to you and the school, and to save time entering the facility, check all this out ahead of time, explain it as best as possible to the students, stick to the rules, and confine if necessary. Yes, improperly dressed or uncooperative students have occasionally spent their time on the bus during a tour.

Communications

After you have received the approval from your administration to conduct the tour, it is time to verify all the facts: who goes, to where, when, and how. The policy as to what paperwork is required for an off campus adventure varies district by district and school by school. Speaking from experience, give yourself at the very least, 4 weeks to get trip permits signed, notarized in some locations, and returned in time for the trip. This in itself can be a challenging task. In order to make sure that all the bases are covered, someone needs to get a letter going that tells all those involved with the trip about the date and time, various locations, contacts and phone numbers, preferably cell. (see appendix) Email this information to all parties (educators, tour facility contacts, bus company) and have a hard copy with you the morning of the trip.

Providing impact for the tour

FLATE's Industry Tours, as stated before, are designed to introduce school students, grades 7 through 12 to the world of modern manufacturing, stimulate their interest in the supporting careers, and encourage enrollment in the essential technology programs available throughout the state of Florida. We have found that preparation is the key to success. Follow-up surveys with our industry partners contain such comments as:

“Prepare the students for the tour with a reason for them to pay attention. Some activity like a treasure hunt, a survey, a fact finding project, prepare a proposal, something that would engage them more than just a show and tell.”

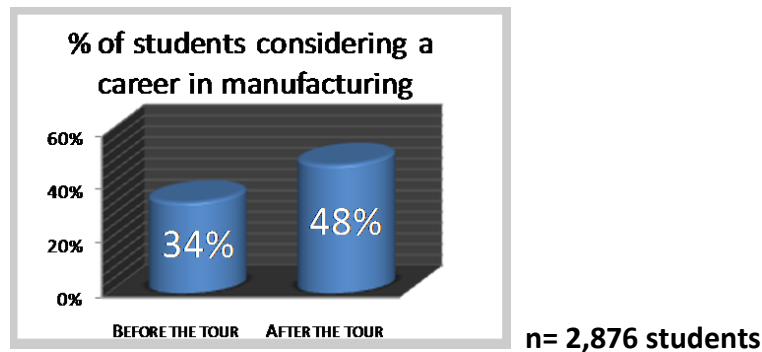
Pre-tour curriculum resources and preparation

- Preparation for a tour can best be done by having the students go through a discussion following the “What Is Manufacturing” presentation (located on www.madeinflorida.org under the Educators tab). By doing this ahead of time, they will be better equipped to spot manufacturing processes during the tour and focus on what is happening around them. (see appendix)
- This is a perfect opportunity for the teacher to tie in careers, career pathways, and the importance of STEM subjects (especially the T & E parts of STEM); the career segment is also appropriate as a post-tour subject. One activity which incorporates research skills, writing, and the use of computer technology is an exploration of the website of the host company for product, process, and career information.
- FLATE provides Florida Department of Education (FLDOE) approved lesson plans meeting Sunshine State Standards which are developed around local industries on the www.flate.pbwiki.com site.

- On the day of the tour, make sure they students are properly dressed and comply with whatever restrictions have been established by the company concerning phones, cameras, etc. Remind students not to leave gum, trash, etc. on the bus to avoid an unexpected and costly clean up charge.

Post-tour curriculum resources and follow-up

- Administer a Post-tour Survey (see appendix) immediately after the tour, (perhaps on the bus ride back to school). You may want to use the comparison between questions 10 and 13 on the post survey to monitor any changes in attitude toward a manufacturing career, which questions produced the highest and lowest scores, etc. This graph provides a visual of the change in student perceptions concerning a career in modern manufacturing.



- A thank you note to the facility personnel along with a copy of the survey results, if used, is really appreciated as it provides materials for their community service files.
- Provide a follow up lesson where students reflect and expand on their experience. A general discussion or even a paper could be assigned on how the students saw the applications of science, technology, engineering and math on the factory floor.
- Provide recognition to your host in the form of a Certificate of Appreciation/Plaque.
- Follow up to see if the tour worked well for your host.
- Make notes about what you would change for next time.
- Consider a press release or posting the tour (with photos) on your school's web page.

FLATE's classroom teaching materials

Utilizing a comprehensive curriculum both before and after the tour is the key to students making the most of the field trip experience. Supplementary materials support instructor goals and provide tangible products for students related to manufacturing and careers. FLATE provides a series of online lesson plans, handouts, and virtual tours to use prior to the tour to start students thinking about manufacturing, and after the tour to keep the interest and enthusiasm going.

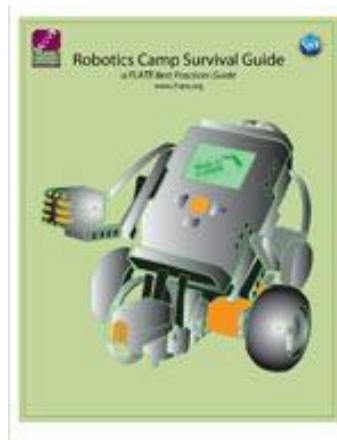
- Samples of pre/post tour lesson plans may be found in the appendix; complete pre/post tour curriculum is available on FLATE’s resource for educators at www.flate.pbwiki.com
- Lesson plans, virtual tours, videos, and online curriculum resources and links are available for K-20 educators at www.madeinflorida.org and www.flate.pbwiki.com
- The *Made in Florida* video about manufacturing in the State of Florida is available on the web at www.madeinflorida.org. “Postcard” handouts (see appendix) and additional information are available by sending a request to David Gula, Outreach Manager, 813.259.6581, outreach@fl-ate.org
- There are many student handouts available for teachers to print or download from the above websites, and range from coloring books to curriculum challenges and sTEem puzzles.
- Career/college information sessions are great ways to revisit the tour experience and resources are available on the *Made in Florida* website.
- David Gula may also be contacted to see about the possibility of arranging a classroom presentation on manufacturing or an Industry Day at your school.

Other FLATE ‘Best Practice Guides’

The Robotics Camp Survival Guide

Available as an online resource of for download at

<http://www.fl-ate.org/projects/camps.html>



Coming soon:

Best Practices Emphasizing the T & E in sTEem Curriculum

Appendix

Industry Tours Planning Checklist

Planning (Allow at least 4 weeks prior to the trip)

- Find your location
- Visit the site to see if this will be an appropriate, exciting site to visit for you and your students
- Decide how much time you are going to use for your tour
- Determine transportation costs involved
- Determine how you will fund your event
- Finalize the date and time for your event and make note of any facility requirements
- Contact the transportation company you have selected to make arrangements
- Compose a list of pertinent contact telephone number and email addresses

Pre-Tour

- Distribute and collect field trip release forms from students
- Compose a letter that provides all of your facts and may be distributed to all parties
- Develop pre-tour lesson plan with pre-tour curriculum and activities
- Contact and confirm your parent-helpers or teacher aids if appropriate
- Contact and confirm pick-up time and place with your transportation provider

Tour Day

- Ensure all students are appropriately dressed and are not carrying inappropriate devices
- No food or drinks carried on the bus
- Bring a list of students names (required by many facilities)
- Bring a hard copy of the contact letter you prepared with your list of contacts
- Bring student handouts (if applicable) and student post tour surveys

Post-Tour

- Administer post-tour survey to students
- Provide a follow-up lesson where students may reflect on their experience
- Provide a press release with photos and/or story about your tour to your school's web site
- Send a thank you note and certificate of appreciation to appropriate facility personnel
- Follow up to see if the tour worked well for your host
- Make notes about what you would change for next time

February 11, 2011

All Adventure Buses
Phone: 940.555.1212
Fax: 940.555.1222

Good Afternoon Everyone:

Here is information concerning the trip between South Port Senior High School and Domino Player Industries to take place on April 7, 2011. The group will be no more than 35 passengers.

April 7, 2011

South Port SHS
6000 Priceless Blvd.
South Port, FL

School Contact:
Doug Mann
Teacher Facility
941.555.1212 c

South Port SHS to Domino

Domino Ind.
1000 High-tech Circle
Winter Haven, FL

Company Representative:
Millie Grove
Manager
941.911.1919 c

Board students/teacher(s) at the school in order to leave by 9:15 am, arriving at the Domino facility by approximately 10:00 am. *I will meet the bus at the facility.*

Re-board students/teacher(s) at plant site by 11:30 am, returning to school by 12:15 pm (they may stop for lunch along the way).

If there are any questions about the tour or changes to the schedule, please call me first (Use the cell number for a quick response) and I will contact all those involved.

David Gula

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Office 813.259.6581
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CELL 813.786.9692



FLATE's Pre & Post Tour Lesson Plans to Enhance Student's Experience

The complete lesson plan is located at <http://flate.pbwiki.com>



NATURE OF CHALLENGE:	GRADE LEVELS
Students will learn about the company they will be visiting	6-8
TARGETED SUBJECT AREA/S	MANUFACTURING LEVEL
Career planning, technology integration	Innovate, Design, Fabricate, Test, Market and Distribute
LEARNING OBJECTIVES – The Students Will....	TIME FRAME
Identify possible career interests Become aware of career options and skills needed Learn how to behave in a professional environment	Suggested three class periods to discuss, plan, and report on the company tour experience and one day to tour the company.

Part A - Pre-Activity Questions and Activities:

Explore the website of the company you will be visiting and answer the following questions:

1. What is the name of the company you will be visiting?
2. What products do they make?
3. Write 1-2 paragraphs about the company.
4. Perform research on job opportunities within the company and find out about educational and skills requirements for the job.

Part B - Engineer's Report: Questions

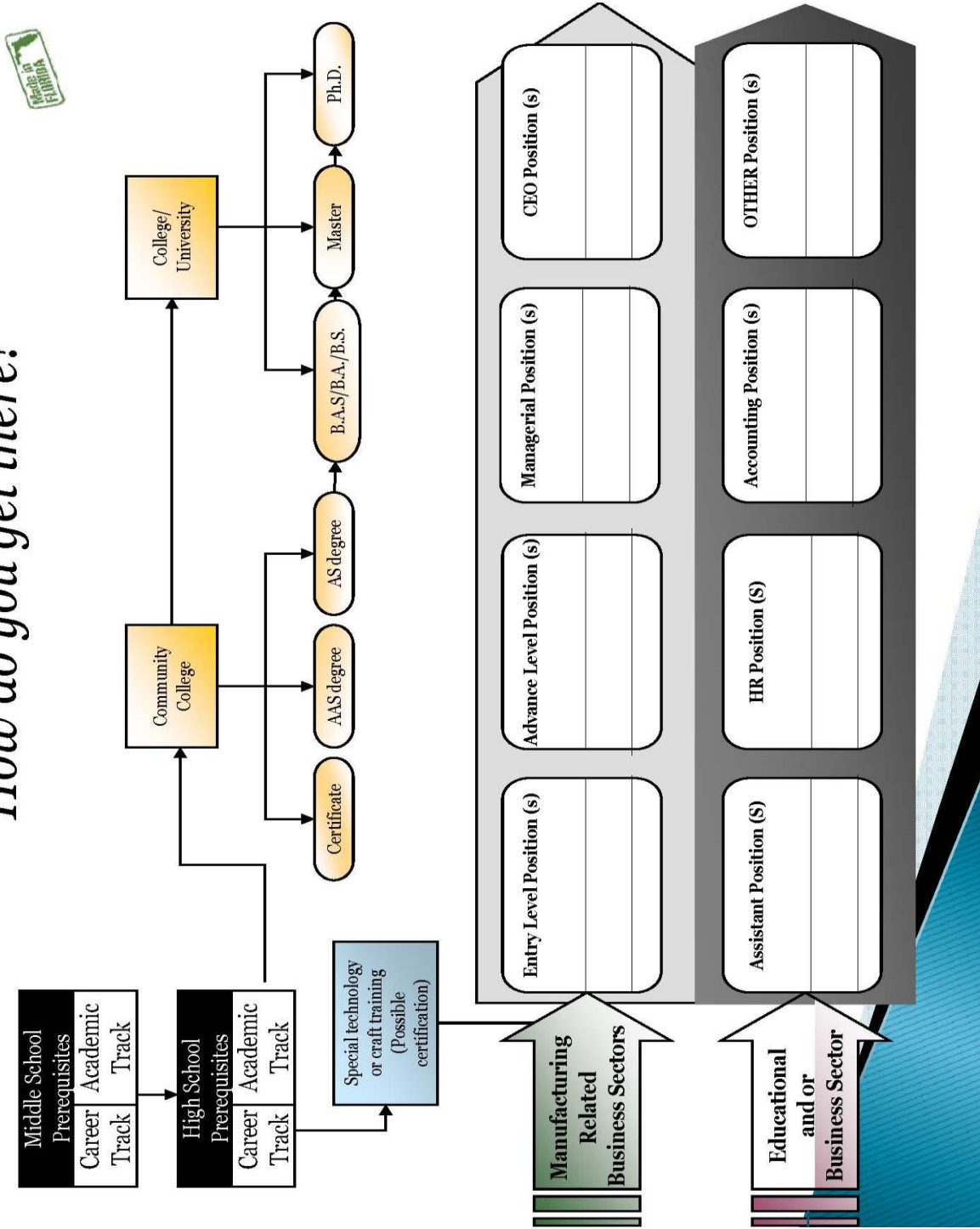
Write 2-3 questions you would like to know about the company you are going to visit. After visiting the company answer the following questions:

Part C - Engineer's Report: Post Activity Observations

1. List the name of the company you visited and the job you shadowed.
2. Write a brief 1-2 paragraph description of what you learned about the company. (e.g. What do they make? How do they make it?).
3. Describe three jobs you saw employees perform during the company tour.
4. Describe the connection between the company you visited and STEM. (e.g. How does that job use science, technology, engineering and math.)
5. Plan out the education and career pathway you would need to take from this point, in order to be capable of working in one of the jobs you described in number 3.
6. Reflect: List a few positive and negative aspects of the company you visited. (e. Does the company you visited perform something to reduce its carbon footprint?)
7. Reflect: How has technology changed this company?
8. Reflect: How has economy changed this company?
9. Predict: What are some future challenges this company might face?
10. Predict: Do you see yourself in this career field? Why or why not?

Path your Career

How do you get there?



Post-Visit Survey – Manufacturing Related Technologies

Instructions: Read the statements carefully. Circle one best answer for each question.

Scale: 5 = Strongly Agree (Yes)
 4 = Agree
 3 = Neither Agree nor Disagree
 2 = Disagree
 1 = Strongly Disagree (No)

5 4 3 2 1	1) I heard or saw employees describe their work.
5 4 3 2 1	2) The workers enjoyed their work.
5 4 3 2 1	3) I found that the work they described was interesting.
5 4 3 2 1	4) I will need knowledge of science for my future work.
5 4 3 2 1	5) I would be interested in technical work in industry.
5 4 3 2 1	6) I would be interested in engineering and professional level career work.
5 4 3 2 1	7) I would enjoy a career in manufacturing.
5 4 3 2 1	8) I understand the importance of mathematics and science at work.
5 4 3 2 1	9) This tour gave me information about careers in manufacturing.
5 4 3 2 1	10) I was considering a career in manufacturing before the tour.
5 4 3 2 1	11) I found the tour helpful to my understanding of jobs and career opportunities.
5 4 3 2 1	12) I would recommend that other students have the opportunity of this tour with industry.
5 4 3 2 1	13) I am now considering a career in manufacturing or related technical industries.
5 4 3 2 1	14) The tour helped me understand the use of math, science, and technology in industry.
5 4 3 2 1	15) I am now committed to making more of an effort for success in school studies.
5 4 3 2 1	16) I want to pursue a high-skill, high-wage career.
5 4 3 2 1	17) I want to learn about technology because I know how useful it is.
5 4 3 2 1	18) I frequently use scientific ideas or facts in my personal life.
5 4 3 2 1	19) I enjoy helping others learn about new technology.
5 4 3 2 1	20) I am curious about science/technology and its important tools and methods.

Made In Florida" website postcard



How to Print this Guide

If you would like to print your guide in a “booklet” format (from the original pdf file), please use the following steps, you will need a printer that can print double sided documents:

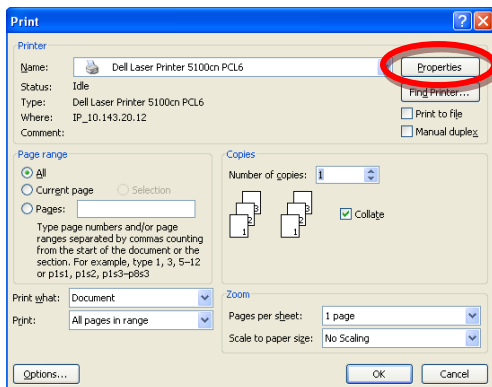
Step 1 – Select *Properties* (please make sure you are using a printer that prints double sided documents).

Step 2 – select Booklet/Poster/Mixed

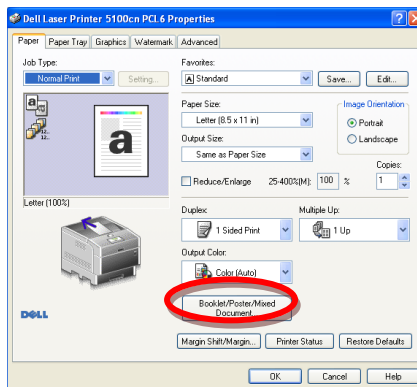
Step 3 – select Booklet Creation and then click OK

Step 4—select Margin Shift/Margins, Print Position Tab, Center, then click OK

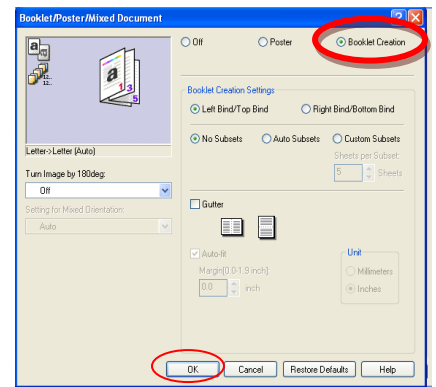
Step 1 – select *Properties*



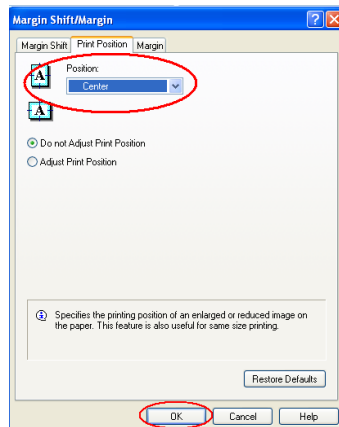
Step 2 – select *Booklet/Poster*



Step 3 – select *Booklet Creation*



Step 4 – select *Margin Shift/Margins*



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