Manufacturing Day Tours: Student Feedback Shows Huge Impact

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This work is funded under grant DUE# 0802436 and DUE#1204571 from the National Science Foundation Advanced Technological Education (ATE) program. Opinions and findings expressed herein are those of the authors and do not necessarily reflect the views of the National Science Foundation. © Copyright 2013

Manufacturing Day Tours: Student Feedback Shows Huge Impact

Since 2005, the Florida Advanced Technological Education Center of Excellence (FLATE) has facilitated close to 400 tours to 234 high-tech, manufacturing facilities throughout Florida for over 10,000 students, and almost 1,000 educators and parents. These tours provide students, teachers and parents with the opportunity to have their eyes opened to the exciting and lucrative world of manufacturing and the many, varied careers the industry offers. One of FLATE's goals has been to provide students with exposure to real Science, Technology, Engineering and Math (STEM) workplaces, primarily those in manufacturing. Students are surveyed after the tours so data can be gathered to discover what the students experienced from their own point of view and to help streamline and improve tours in the future.

FLATE coordinated statewide events on Manufacturing Day/Month for the second time in 2014, working with partners and collaborators around the state. These included a number of manufacturers associations, colleges, workforce organizations and the Florida TRADE consortium. Table 1 (2014 Manufacturing Day Data) provides a brief overview of the numbers. It was a fantastic success and did much to place Florida firmly on the national manufacturing map. More than 3,000 students from 39 counties toured 88 facilities across Florida. Surveys were completed by almost 1,500 students.

Table 1 – 2014 Manufacturing Day Data

Florida Manufacturing Day 2014	
Counties	**39**
Student Tours	**95**
Educators	**174**
Parents	**113**
Students	**3,150**
Students Surveys	**1,496**
Manufacturing Companies	**88**

The inaugural National Manufacturing Day was held on October 3rd, 2012 and it has continued to grow each year. The event is supported by a group of industry sponsors and co-producers and strives to improve the manufacturing industry's image problem while at the same giving manufacturers a chance come together and voice concerns associated with training and recruiting future industry employees.

Many still believe that manufacturing consists of crowds of workers handling widgets in dirty, run-down factories for little compensation – a far cry from current reality! "Part of the problem is the media and Hollywood, who often portray manufacturing in a poor light, denigrating anyone who works with their hands," said actor John Ratzenberger, founder of the Nuts, Bolts & Thingamajigs Foundation (NBT) that encourages young people to consider careers in manufacturing. The manufacturing industry's poor image during recent years may be the most dominant factor driving the serious shortage of skilled workers. The Department of Labor (DOL), in a candid overview, stated, "Manufacturing confronts a negative image, characterized by such phrases as "declining," "dirty," "low-pay," etc. The Advanced Manufacturing Industry, Employment and Training Administration, a division of the DOL, also added that "A modern

manufacturing facility today bears little resemblance to a traditional factory of decades past," and, “Popular perceptions of manufacturing jobs as dark, dangerous and dirty are largely outdated as advanced robotics and other ‘intelligent’ systems become pervasive throughout the manufacturing process.”

As a result of this severe image problem and the disconnect between perceptions and the reality of jobs in the manufacturing industry, many parents and schools do not encourage their children/students to pursue manufacturing careers, resulting in a complete lack of understanding, awareness and interest among the next generation of workers. The Manufacturing Institute’s annual Public Perception of Manufacturing Report (2015), states that “only 37 percent of respondents indicate they would encourage their children to pursue a manufacturing career. “

All of this at a time when the shortage of skilled workers continues to increase rapidly and the need for them is greater than ever. The U.S. Bureau of Labor Statistics forecasts that by 2020, there will be a shortfall of almost 10 million skilled workers in manufacturing-related industries. People don’t realize that careers in the world of modern manufacturing provide opportunities to do life-saving work, put men on Mars, and are high-tech, highly-skilled, rewarding and lucrative.

By giving manufacturers the opportunity to show tour participants first-hand what the real-life world of manufacturing looks like today, these widely-held misconceptions about manufacturing can be eliminated in a highly effective way. Students are exposed to some of the challenging and exciting careers available in the manufacturing industry. Manufacturers are able to address the prevalent skilled labor shortage that the industry and their companies are facing.

FLATE has developed and implemented processes for organizing and deploying effective student tours of manufacturing facilities and determining the impact they have on students and educators. Data collected includes anecdotal evidence based on feedback from students, industry hosts, staff, and teachers as well as aggregated survey results from eight years of student tours of manufacturing facilities. Survey data collected from 2014 Manufacturing Day student tour surveys were analyzed and illustrated in Table 2 - 2014 Manufacturing Day Survey Data.

Table 2 - 2014 Manufacturing Day Tour Survey Data

2014 Manufacturing Day

Counties: Alachua, Broward, Clay, Citrus, Escambia, Hernando, Highland, Hillsborough, Lake, Lee, Leon, Levy, Manatee, Marion, Pasco, Pinellas, Sarasota

Participants: 1496

Questions	1	2	3	4	Average
2. Before going on this tour, I had not considered a career in advanced manufacturing.	208	376	427	267	2.6
3. Today I learned about technologies used in advanced manufacturing industries.	22	40	408	808	3.6
4. I learned something new and interesting about manufacturing products.	26	46	354	852	3.6
5. The tour made me think about careers in advanced manufacturing.	72	176	574	456	3.1
6. The tour helped me understand how STEM subjects learned in school (science, technology, engineering and math) are put to work in advanced manufacturing industries.	36	137	576	529	3.3
7. This tour gave me new information about careers in advanced manufacturing.	27	69	512	670	3.4
8. After taking this tour, I think I will consider a career in advanced manufacturing.	138	316	541	283	2.8
9. I would recommend that other students have the opportunity of this tour.	33	64	400	781	3.5

1= Strongly Disagree
2= Disagree
3= Agree
4= Strongly Agree

Male: 785 **Female:** 286

Ethnicity:
Asian: 75 Black: 234 White:458 Hispanic:474

Total Surveys: 1278
Overall Average: 3.2
Surveys Returned: 85%

School Grade:
9th:76 10th:306 11th:339 12th:287

Before going on the tour, 46% of the students had never considered a career in manufacturing, 60% said that the tour made them think about careers in advanced manufacturing and student data indicated that over half (55%) were now considering a career in the field. Eighty-one percent of students reported that they learned about technologies used in today's advanced manufacturing industries and 74% of students felt that the tour help them understand how STEM subjects they learn in school are put to work in advanced manufacturing industries. These are significant findings and provide strong evidence to reinforce that fact that manufacturing facility tours are an invaluable and significant tool. Participation in industry tours helps to dispel misconceptions about what today's manufacturing industry really looks like, and the exciting, and high-wage careers it offers.

This year's analysis was conducted with an added emphasis on parsing out "themes" of student feedback to the question: "What did you like most about the tour?" Eleven themes emerged and these are shown in Figure 1 (Student Feedback Themes). These categories were refined after further analysis and the final 6 categories are shown in Figure 2 (Main Themes), along with a sampling of corresponding student comments in Table 3 (Students' Responses Categorized by Themes)**.** For complete table, see Appendix).

Figure 1 – All Student Feedback Themes

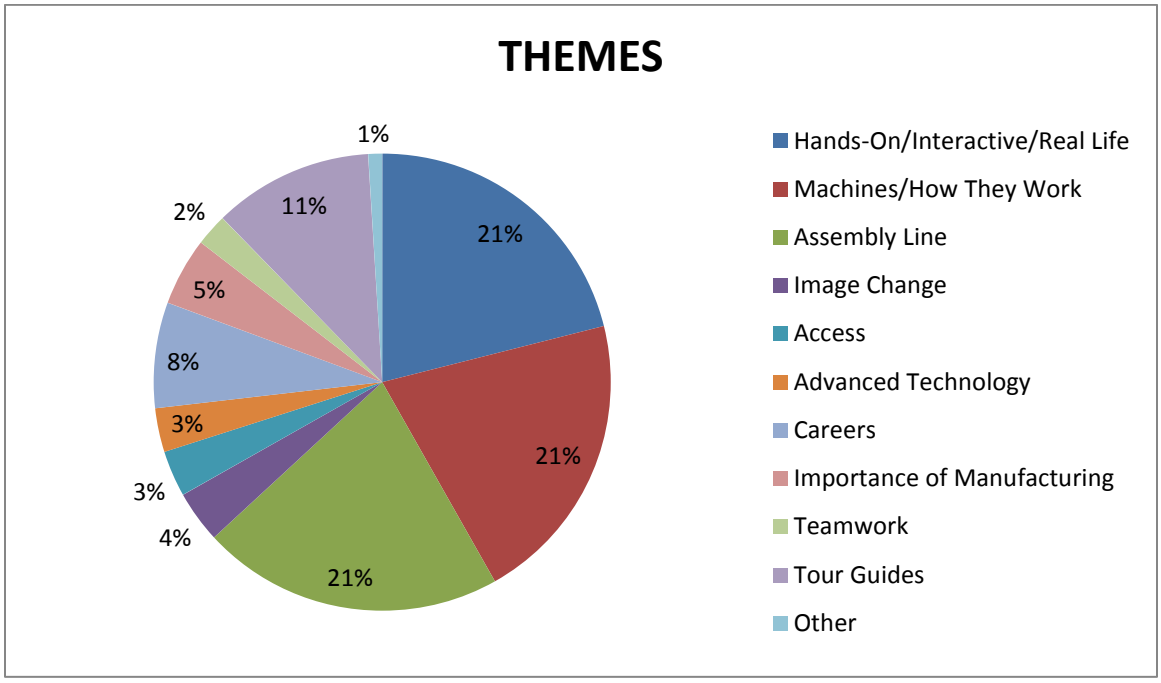
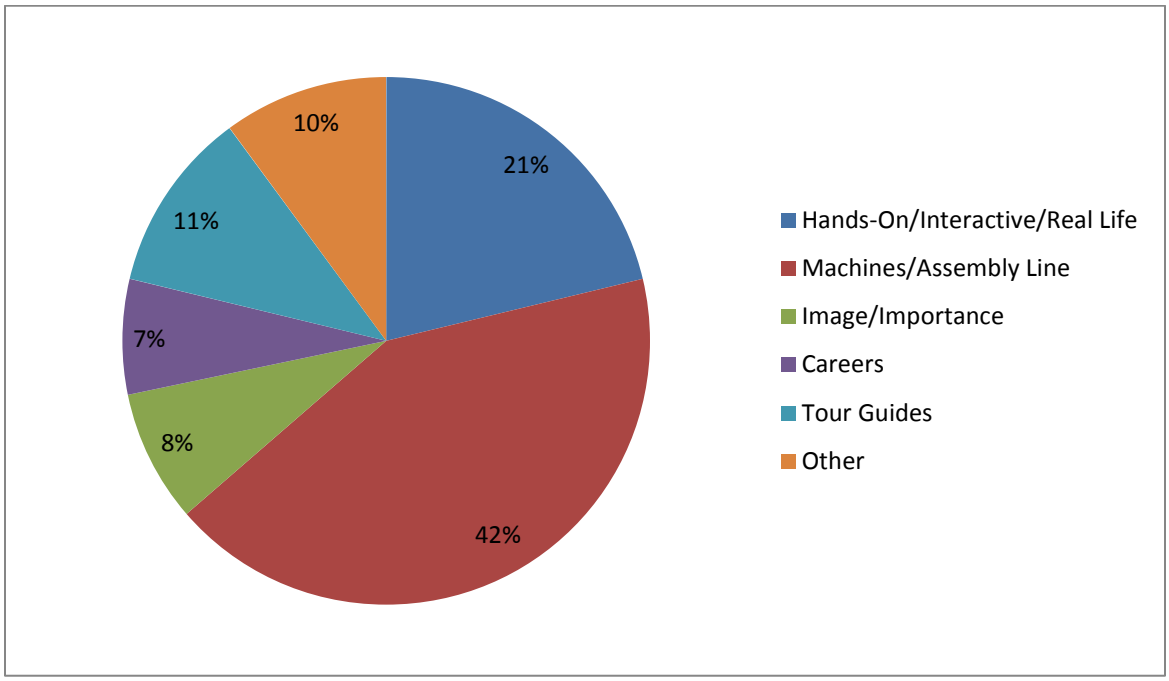


Figure 2 – Main Themes



Almost half of the student responses (42%), had to do with being able to see all the machinery in action and a real assembly line showing the stages of manufacturing from raw materials through to final products. The hands-on, interactive and real-life nature of the tour experiences was the second largest category, with careers, tour guides and manufacturing's image and

importance all received significant numbers of responses to the question, “What did you like most about the tour?”

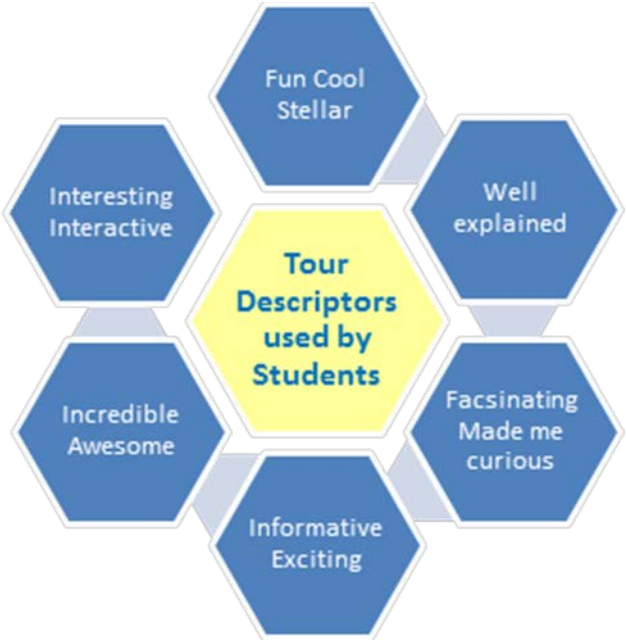
Table 3 – Students’ Responses Categorized by Themes

Themes
Hands-on/Interactive/Real Life • *I really enjoyed seeing the huge CNC machines at work, and the real life experiences of being in manufacturing.* • *Learning about real life applications for machining.* • *I learned how a real machine shop and work experience looks like. I found it really interesting.*
Machines - how they work /in action – assembly line • *I really liked getting to see the equipment. It also was cool to learn about how it all worked.* • *My favorite part about the tour was going to the floor. I liked looking at all of the different machines it took to make different things.* • *I liked when we walked through and saw the production process.* • *I most enjoyed getting to see what I’ve heard about in action.* • *Also the staff that showed us around helped us get a feel for what the workplace would be like.*
Manufacturing Image/Importance • *This tour gave me a different perspective of manufacturing* • *The factory was clean and looked like others can be a good opportunity to work with a good company* • *I learned about the uses for society that these products could make and how we can improve society as a whole* • *The thing I liked the most about this tour is seeing businesses in the community that can become a job for me in the future* • *It was very interesting to see the far reaching effects of local manufacturing*
Careers • *I liked the staff and appreciated their views on career paths and options for the future.* • *I enjoyed learning about the various jobs here. My favorite part of the tour was learning that there was no degree needed for working here. The incentive of an on the job training has inspired me to try out a career in advance manufacturing.* • *The fact I would like to apply here when I turn 18* • *Employees took the time to interact with us during the tour and thoroughly explained to us what they were working on and what training and courses they took to get to the point that they are now.*
Tour Guides • *The way they explained, everything to make it simple to understand.* • *How well the presenters explained the process.*

• *The tour guy explained everything perfectly and he really knew what he was doing. He answered every question we had.* • *I love how the employees were so passionate about what they do and they truly enjoy their job* • *The people were very specific with their explanations the people were very welcoming* • *I liked most how the tour guides explained everything to us; they also answered all our questions.*
Other • *Precision/accuracy/importance* • *Teamwork* • *Access*

This student feedback is hugely powerful and details the great depth of impact these tours had on the participants. Figure 3 (Tour Descriptors), highlights some of the words students used to describe their tour experiences. Students took the time to give detailed feedback about what the tour experience meant to them.

Figure 3 – Tour Descriptors

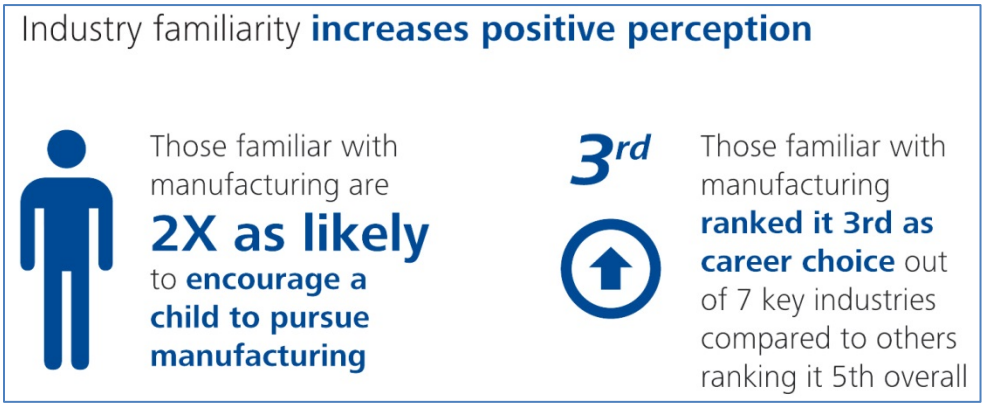


Careers

Findings overwhelmingly support the importance of exposure to real-world work environments and real people doing real jobs, for the next generation manufacturing workforce. Students were exposed to the range of careers available in the industry, from engineer and scientist positions requiring a 4-year degree, to CNC helpers who can enter the workforce straight from high school. They learned about training and apprenticeships and the importance of studying hard at school for later career success. Student feedback reinforces this strongly – "*I enjoyed learning about the various jobs here. My favorite part of the tour was learning that there was no degree needed for working here. The incentive of on the job training has inspired me to try out a career in advance manufacturing" and, "I liked the staff and appreciated their views on career paths and options for the future."*

Figure 5 (Impact as a Result of Industry Exposure), from an infographic produced by the Manufacturing Institute (2015), illustrates what a significant impact exposure to the industry has.

Figure 5 – Impact as a Result of Industry Exposure



Tours offer an effective way to increase participants' industry familiarity, and in turn contribute to raising the number of parents and educators encouraging their children/students to explore the world of modern manufacturing and all its related careers.

Manufacturing industry and future workforce connections

Manufacturers expressed that student tours of their facilities provided a highly effective way to aid in educating and/or creating a talent pool for a future workforce. They stated that the tours served as a conduit between manufacturers and local educational facilities opening a pathway for partnership which "could lead to future internships and employees". In a recent article by Nicole Schepker in the New England Journal of Higher Education, she states, "Ultimately, no one knows the current and future needs of industry better than industry members themselves, making it imperative that advanced manufacturers and other STEM professionals continue to work with educators to develop curriculum, provide guidance and opportunities for students

and teachers that will make STEM education relevant, while preparing students to succeed in the ever-changing workplace of tomorrow and today."

Classroom-manufacturing industry connections

It is crucial that educators make connections between what students are being taught in their classrooms and the real world. Industry tours are a highly effective tool to achieve this goal. Survey data illustrate clearly that educators were significantly impacted by their tour experiences. They articulated that the tours gave them a deeper insight into today's manufacturing industry and the careers it has to offer their students, as well as helping them to integrate STEM throughout their curriculum materials. Industry tour experiences aid them in developing a more authentic, application-based curriculum. Outreach to students and educators should be two-pronged – first, ousting the industry's negative image and secondly, highlighting the opportunity to use fun, high tech, computer skills and securing a career that pays well and offers advancement.

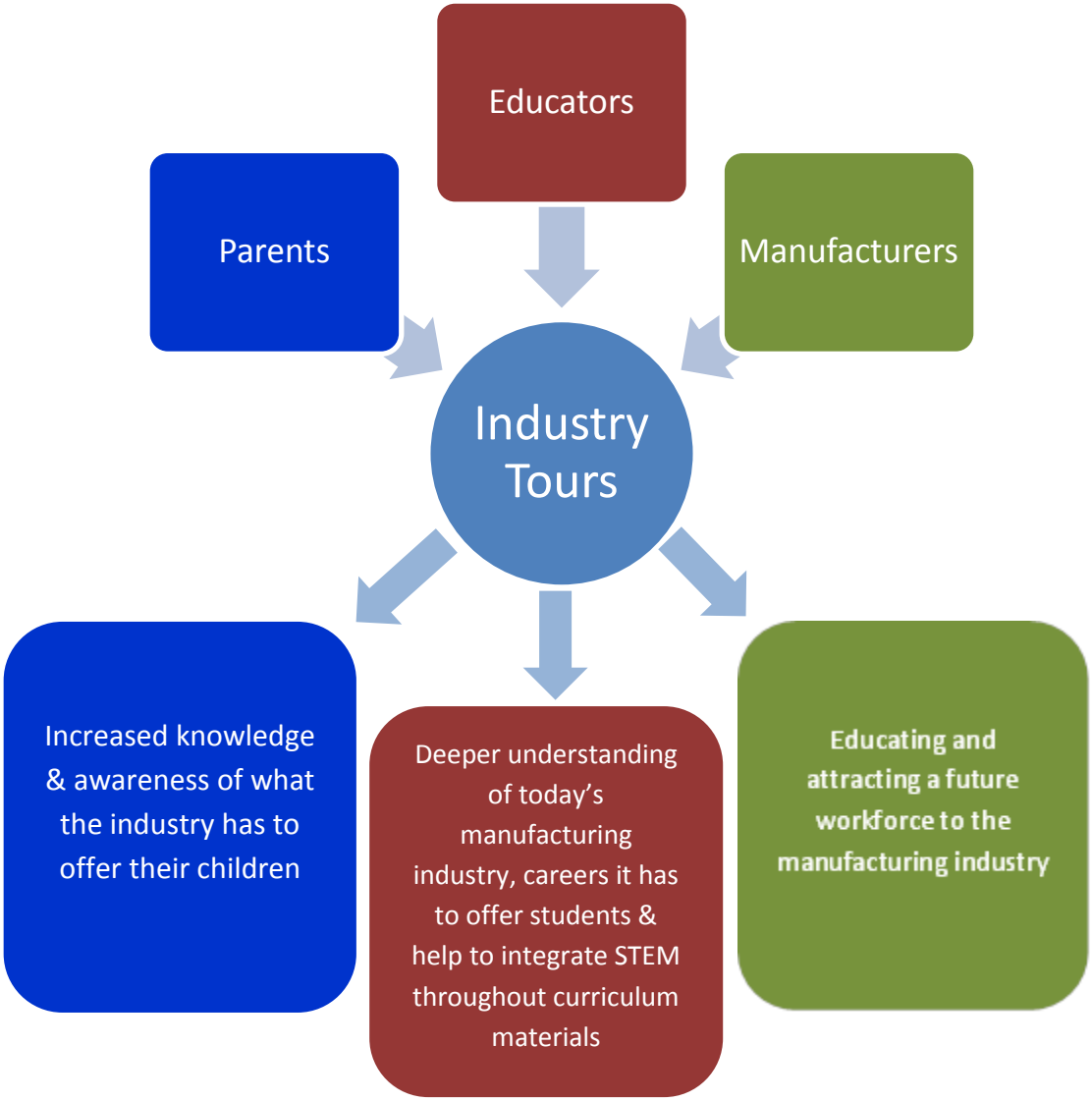
Tours provide benefits for all

Clearly tour experiences are a "win-win-win" for students, educators and manufacturers and are invaluable in contributing to the goal of creating a new and positive image of modern manufacturing – one based in reality rather than widely-held stereotypes (Figure 4 (Tour Benefits), shows a graphic representation of how each of these groups benefits). It is hugely gratifying to read students' feedback relating to how the tours impacted their view of manufacturing, "*It was very informative on manufacturing and it made me consider a career in manufacturing", "I liked how we were actually allowed to walk around and see how a lot of the machines work. I also thought how we were allowed to see how much they actually earn, because in all honesty, people don't really think they make much and this put a whole new perspective in my eyes".* Tours provide face-to-face experiences for students allowing them to discover first-hand how important and relevant the STEM subjects they are learning in school are in the real world of work. *"Tours can be especially valuable to high school students as they have the opportunity to see, hear and learn about different jobs and careers that people have in high tech industries."* (Barger, M., Gilbert, R. & Boyette, M. (2013). Students are able to connect with individual employees working in the field, helping them to make informed decisions about what does and doesn't interest them, and giving them a clear and accurate picture of what a future job in the industry looks like.

Tours should be central components of secondary and post-secondary manufacturing and technical courses and programs. Educators can easily integrate tour experiences into their classroom curriculum with a little assistance from the industry tour host. Tours can be tailored so that they align well with student learning objectives. They effectively aid educators in the integration of technology and engineering into mainstream and STEM course objectives. They provide students with the opportunity to see real-life examples of what they have learned in the classroom translated into actual practice in a manufacturing facility (Survey data from 2014 Manufacturing Day tours indicated that 74% of students felt that the tour help them understand how STEM subjects they learn in school are put to work in advanced manufacturing

industries). Tours can "spark" students' interest and lead to them considering a future career in the manufacturing industry - student feedback reinforces this: *"I liked that I got to learn more about manufacturing and machinery. It taught me about new opportunities", "I would like to apply here when I turn 18", "The show of the company was very cool and I might want to intern here".* Students were also able to see how the manufacturing industry and related careers positively impact and contribute to society, *"I learned about the uses for society and how we can improve society as a whole", "I really enjoyed seeing the places that products get made that really help people's lives", "I loved seeing the different types of products that are manufactured and how they benefit the world today".*

Figure 4 - Tour Benefits



Planning for Manufacturing Day 2015 is already well underway. FLATE is working hard to grow participation as well as increasing the impact of tour experiences. Staff will be working closely with teachers before the tours to make sure they are comfortable using the pre-tour lesson plans and associated activities provided to them. Teachers and parents accompanying students on tours will also be surveyed as these individuals are instrumental in providing accurate and up-to-date information about what the manufacturing industry has to offer their students/children. "If parents and teachers don't have personal experience in today's manufacturing, they can't guide their children with accurate opinions and information about manufacturing careers," said Pat Lee, FMA Public Relations Director and a member of the Rockford, Ill., Chamber of Commerce Manufacturers Council.

To extend the scope and deepen the impact of the tour experience, teachers will be encouraged to have a debriefing discussion with their students post-tour, as well as utilizing follow-up lesson plans and activities. Additional efforts will focus on adding new tour locations and increasing student participation through regional organizational partnerships. As the critical need for a skilled manufacturing workforce increases, it is essential that educators, parents and manufacturers work together to raise awareness, combat the industry's negative image, and to spotlight and promote advanced manufacturing and the wealth of incredible careers it has to offer. Manufacturing industry tours are a proven and highly effective tool for achieving these goals.

Resources

Barger, M., Gilbert, R., Boyette, M. (2013). Impact of Student Tours of Manufacturing Facilities, American Society for Engineering Education, 120th ASEE Annual Conference and Exposition Proceedings.

Barger, M., Gilbert, R., Boyette, M. (2013, September). Made in Florida Industry Tours: A Best Practice for Seeding Industry Partnerships. *Techniques, Connecting Education and Careers*, 26-29.

Barger, M., Boyette, M. (2013). Industry Day Programs Connect Students with Florida Manufacturers," *National Career Pathways Network Connections*, *23* (1) 4-6.

Barger, M., Boyette, M., Gula, D. (2013). Industry Tours for Students, a FLATE Best Practice Guide.

Barger, M., Gilbert, R., Boyette, M. & Bagley, D. (2014). A Statewide Initiative for Manufacturing Day in Florida. American Society for Engineering Education, 121st ASEE Annual Conference and Exposition Proceedings.

Barger, M., Gilbert, R., Boyette, M., (2013). Impact of Student Tours on Manufacturing Facilities. American Society for Engineering Education, 120th ASEE Annual Conference and Exposition.

Department of Labor, U.S. Bureau of Labor Statistics (2012). *Employment Projections.* Retrieved March 27, 2015 from http://data.bls.gov/projections/occupationProj

www.mfgday.com/

Deloitte, Manufacturing Institute, (2015). Public Perception of Manufacturing Report. Retrieved June 23, 2015 from http://www.themanufacturinginstitute.org/~/media/DD8C9A2E99B34E89B2438453755E60E8/2015_Public_Perception_of_Manufacturing.pdf

Ratzenberger, R. (2015). The Manufacturing Crisis. Retrieved March 29, 2015 from ratzenberger.com/the-manufacturing-crisis

Schepker, B. (2014). Educating the Next Generation of Makers. *New England Journal of Higher Education.* http://www.nebhe.org/thejournal/educating-the-next-generation-of-makers

Special thanks to our regional coordinating partners:

Florida TRADE
Manufacturers Association of Florida
Regional Manufacturing Associations:

- First Coast Manufacturers Association
- Northwest Florida Manufacturers Council
- Bay Area Manufacturers Association
- Upper Tampa Bay Manufacturers Association
- Southwest Regional Manufacturers Association
- Capital Region Manufacturers Association
- Marion Regional Manufacturers Association
- Manufacturers Association of Central Florida
- Sarasota-Manatee Manufacturers Association

Sebring Airport Authority

Appendix

Manufacturing Day Tour Survey Themes and Corresponding Student Comments

(Respondents = 1,496)

Themes	**Quotes**
Hands-on /Interactive/Real Life	*I liked the hands on experience the most it was cool when I got to use the measurement equipment.* *Using some of the machines to measure objects and seeing machine doing a measurement.* *In this tour I liked being able to put my hands on the equipment.* *I enjoyed the hands on instructions of the machines.* *I got to experience how a real welding shop is run. It also was very interactive.* *What I liked the most was the hands on activities.* *I really enjoyed seeing the huge cnc machines at work, and the real life experiences of being in manufacturing.* *Learning about real life applications for machining.* *I learned how a real machine shop and work experience looks like. I found it really interesting.* *I really liked that tour. It showed me many different machines that we use in the everyday world in manufacturing.* *That we were able to learn more about this and see and touch in person.* *I enjoyed the hands on aspects.* *I really enjoyed seeing the different machines. It really opened my eyes to how much we have evolved. I finally got to see what was on how it's made in real life.* *I liked how everything was thoroughly explained, also I liked how there were examples so we could visually look at it.*

	I like how we had the opportunity to interact with the employees and construct our own windows. And to talk with some of the engineers. I liked that we got to walk and experience the things these people do. I also liked that it was a learning experience rather than just a field trip I liked being able to see how manufacturing is in the real world. I also enjoyed seeing how it's actually done. *I liked seeing the places in their everyday working order I was able to see what type of environment to expect when working at the types of places we visited.* *I enjoyed the trip because of how interactive the tours were. At Winco the workers volunteered to demonstrate how certain machines worked.* *The thing I liked best about this tour was we were able to see and touch things.* *What I liked most about the tour was the interaction with students. The tour was fun and I learned new information.* *I liked the opportunity to see how the skills for manufacturing are applied to the real world.* *I really liked that we were allowed to touch and examine the circuit boards.* *I got to interactively look at and learn about some of the projects here.* *I liked how they demonstrated how the machines are working on the ground. They also explained in detail how and what kind of machines and tools they provide use.* *I enjoyed an up close and personal experience with the machines and equipment used.* *I liked that we got to see the entire facility. I also liked how we were able to see and touch some of the products Ventel manufacturers.* *I liked how we got to see the process of creating some of the products that are used each day in households.* *I just like how all the machinery was explained and we got to touch some of the tools.* *I had fun! We got to hold tools that we never knew existed.* ☺

	I enjoyed actually seeing the machines work. I liked the hands on aspect of holding the materials and finding out what they do. *I liked the experience because I got to see what a real machining facility and what it is like in a real live working shop.*
Learning about machines and how they work – seeing machines in action	*Being able to actually see how it works through experience, not animations. And seeing the massive size of it.* *Seeing advanced machines in use and getting the opportunity to use them.* *I found watching the machines in action interesting.* *What I liked most about his tour was when we got to watch the workers make the parts and assemble the hot pipes.* *It was exciting to see all the cool machines, the information was inspiring.* *I liked the machines and how the guide explained the use of each machine.* *I loved all the cool machines and models. I also loved when I got my face scanned.* *Going through the factories and seeing how all the machines work.* *What I like the most about this tour was watching those machines working.* *What I like most about this tour was the different manufacturing machines that used for certain purposes.* *I really enjoyed seeing the huge cnc machines at work, and the real life experiences of being in manufacturing.* *I liked all of the machines that we got to see including how they are operated, the type of parts they make and the overall look of the machines.* *I enjoyed learning about the different machines the cnc was especially interesting with all of its mechanics.* *I really liked getting to see the equipment. I also it was cool to learn about how it all worked.* *My favorite part about the tour was going to the floor. I liked looking at all of the different machines it took to make different things.* *The process was interesting to learn about.*

	I liked watching the metal being poured and filling the molds. The process is much more detailed than most people would think. *One thing I liked most about today was learning about the machinery. I didn't think manufacturers used so much different machinery.* *I liked learning all of the jobs in manufacturing engineering and also learning about all of the machinery.* *Learning about how things are made and how I can apply certain things to my life.* *There are many things I enjoyed about this tour, but my favorite was how they actually told you how to work the machines then showed you what they do on a normal basis.* *I enjoyed learning about the manufacturing process and seeing the factories in action.* *Seeing how everything was done from start to finish. It was amazing to see.* *Being able to see what we do but on a larger scale. Also seeing these parts into large groupings working together.* *I was intrigued by how the entire system was implemented between the machines and staff.* *I enjoyed how we were shown all of the machines and how they worked.* *What I liked most about this tour was that I learned about how the machines work and operate.* *The tools/machines that he showed were all very cool and interesting. It's more complex than I thought.*
Teamwork- many different people who play a role in the process	*I like how it's a team effort to make the parts.* *I liked getting to see all the different equipment and how they work. All getting to see production lines and everyone role is manufacturing.* *I liked the assembly part. Seeing how everyone and everything comes together* *I found it very interesting how they can make everything come together by collaborating on ideas and making it all work.*
Assembly line from parts-final products –	*Being able to see the full process.*

seeing the whole manufacturing process	*I liked learning about all the different processes and machines that they use.* *Seeing all the machining processes and the assembly line* *I liked when we walked through and saw the production process.* *The thing I liked most about this tour is how the many different machines come together. Also the different products used.* *I liked learning how the products were made. Everything looked very organized and was very timely* *What I enjoyed the most would have to be being able to walk around and view the machines and employees at work. I also enjoyed seeing the whole process form getting the metal to being packaged and shipped.* *I liked that we got to see all the machines. I also liked that we got to see how the products were made.* *I liked the engineering part of this tour. Seeing how they test the windows and make the products really interested me.* *I liked how everything as organized and how machines played an important role in manufacturing.* *I liked seeing the different machines and their versatility. It was really neat to see the machines that could do the entire process within itself.* *I enjoyed the facility the most. The machines were very interesting I also enjoyed the quality of the employees they were informative.*
Manufacturing Image Change	*This tour gave me a different perspective of manufacturing.* *Also it changed my perspective on how a machining factory looks like.* *The factory was clean and looked like others can be a good opportunity to work with a good company.*
Access to behind the scenes areas during the tours	*I loved how we got to go on the last floor and see how the stuff works. And now we got to be in the restricted areas for employees only.* *When you got to go on the 1st floor and into the room that has the big screen where you got to see everything going on in the whole airport.* *I like that this tour actually lets me see what is happening behind the scenes.* *I was able to go in the pre fab buildings and see what how everything is*

	setup and how it works. *I liked how were actually allowed to walk around and see how a lot of the machines work.* *The most interesting things about this tour was that you got to see the entire facility.* *I liked that the tour actually got to every part of the plant. Also the friendly and fun aspect of the groups.* *I liked the fact we got to explore the entire shop and learn how machines work.*
Advanced Technology used in manufacturing processes that go into making the final product.	*I liked learning about all the technologies. I liked seeing a 3d printer in real life.* *The technologies used in industries make me most curious.* *Welding device, learning more about advanced technology.* *I liked the fabrication department the most. It was cool to see how all the products were formed, fitted, and put together.* *I like the machines and lasers. It is cool that these machines can make tiny components that operate in our lives.* *Liked to see the advancements in computers and materials available now, and how they are used in an industry.* *I liked all of the cutting edge technology that is used to make the specific tools.* *I liked the technology that I saw today. The amount of quality control in the company is astonishing.* *I liked most about this tour was the technology used to make their products.*
Careers, jobs available, educational requirements, jobs available at the company being toured Not all require degrees, will hire high school grads	*I enjoyed learning about the various jobs here. My favorite part of the tour was learning that there was no degree needed for working here. The incentive of an on the job training has inspired me to try out a career in advance manufacturing.* *What I liked most about the tour was I had the ability to see some hands on jobs that involve engineering.* *I liked the staff and appreciated their views on career paths and options for the future.*

	I enjoyed how the guides explained the different jobs and how they coincide with each other. *I liked how I was given the opportunity to go and look at job opportunity that I want to do. I like being able to learn about the different types of engineering used.* *The tour was informational and provided enough information to provide career opportunities.* *I also like the fact that they are willing to hire high school grads.* *I liked how there were different positions available.* *I liked how the tour gave me a small picture of what having a career/job in a medical manufacturing company.* *meeting experienced employees* *It was very information on manufacturing it made me consider a career in manufacturing* *learning about the jobs available from an associates to PhD levels* *I liked learning all of the jobs in manufacturing engineering.* *The fact I would like to apply here when I turn 18.* *I liked most that I got to see different ways manufacturing is used. I liked that we learned how many different jobs there are in manufacturing.* *All the different types of machines and how detailed their work is. The factory was big and had many different types of jobs.* *Learning about molding company and what it does seeing all the jobs that people do.* *I liked seeing the warehouse where they full up the canisters. I would consider applying for a job here after this tour.* *Employees took the time to interact with us during the tour and thoroughly explained to us what they were working on and what training and courses they took to get to the point that they are now.*
Importance of manufacturing in daily life/to	*I greatly enjoyed the tour because of the constant applications to daily life.* *That we learned about 3d printers. Also we had learned what important*

society/community	*things they are used for.* *Going to the manufacturer to learn how manufacturing works and why it's important* *It was very interesting to see the far reaching effects of local manufacturing* *I loved learning more about topics and new ideas that I had touched on. Also I learned about the uses for society that these could make and how we can improve society as a whole* *The thing I liked the most about this tour is seeing businesses in the community that can become a job for me in the future. Also I like to learn about new things.* *The thing I learned and liked about the tour was how big of an impact advanced manufacturing has on our everyday life. The tour was interesting and held me attention from the beginning.* *The tour showed the details about manufacturing and how it is more important than people think. Everything used in our daily life is manufactured.* *Touring Golden Flake opened my eyes to how manufacturing really worked. Krausz gave an insight to how their products helped others, and keep the pipes necessary for society working.* *What I liked most about this tour was seeing all of the work that goes into making our cities run.* *I really enjoyed seeing the places that products get made that really help people's lives.* *I liked the opportunity to see how the skills for manufacturing is applied to the real world, I also liked seeing the bigger scale of tools we use.* *The involvement of the military and exclusive service to the special operations community. I liked the military innovation. And seeing how we as a country begin to advance rapidly with our military science and technology.* *I loved seeing the different types of products that are manufactured and how they benefit the world today.* *Everything caught my eye and there was lot to look at. I really learned a lot of information about the weapons and technology that defends my country.* *I liked that we saw the process of this company. I also learned a lot about my community.*

Tour guides explained things in an “easy to understand” way	*The way they explained, everything to make it simple to understand.* *How well the presenters explained the process.* *I like that it was so much machinery in the place and he explained everything to us also he answered all of my questions.* *I liked the fact that the information was given properly and then was explained.* *I love how the employees were so passionate about what they do and they truly enjoy their job.* *The people were very specific with their explanations the people were very welcoming.* *The people were very friendly they seemed like they knew what they were talking about.* *I liked how they explain everything thoroughly. Also I liked looking at the machines.* *I liked how they explained everything to a detail where I understand.* *I liked most about this tour is that everyone is friendly and willing to learn from each other.* *I enjoyed that my questions were all answered readily and especially the great details gone into during the explanation. Another piece I enjoyed was being able to bring home a piece of excess solder as a souvenir.* *I liked learning about the different typed of machines and how the sun helps things work. I liked how Paul explained everything to us.* *I liked the automated robot. I also liked our tour guide because he was very knowledgeable.* *I liked the class 1 field trip the most because it felt like a real tour. I also liked how they explained in-depth of what their company is all about.* *I appreciated the staff’s enthusiastic attitude throughout the tour. I also liked the details the tour gave.* *The tour guides were kind and educating in their manner.* *The tour was exciting. The staff who gave us the tour was nice and it was very interesting*

	The people were also very generous and nice. *The tour guy explained everything perfectly and he really knew what he was doing. He answered every question we had.*
History of Manufacturing/History of the companies toured	*That we got to learn about the history of manufacturing.* *I liked the beginning when we learned about the start of the manufacturing.* *I liked learning about the history of Gasco and how much progress they have made in the company.*
Seeing the working environment "in action"	*Also the staff that showed us around helped us get a feel for what the workplace would be like.* *I got to see how a big manufacturing shop is and how they let us see all the large equipment and what it does* *How everyone was friendly and looks and seems like a good place to work* *I liked that the tour game me an opportunity to see how a shop works.* *The part I liked most about this tour was that it showed me a working environment* *It was a good experience, I learned how manufacturing works. It was really interesting.* *My favorite part was going through the factory and seeing where stuff was made and shipped* *I most enjoyed getting to see what I've heard about in action* *I liked seeing the practical applications of the solar panels. It was fun seeing all of the possibilities* *Demonstrations and practical applications of equipment and how they are used in manufacturing. Also careers fields which utilize these skills* *Seeing really cool inventions and learning how they function* *I liked seeing the wave soldering machine. It was nice seeing the whole process and how it worked* *I liked learning about compressors and the different jobs* *What I liked most was just in general getting to see manufacturing you*

	wouldn't normally see. *It had a lot of interesting machinery also it shows great uses of it and projects.*
Precision/accuracy importance	*I liked how I got to learn about how things are manufactured also how precise and accurate the equipment has to be.* *I liked the different machinery that is used to make different parts. I also liked how precise each part has to be made.* *I liked the measurement part. I found it fun to use the electronic measuring tool.* *All the different machines and how precise they have to be when manufacturing these products.* *The robot placing and welding the small parts. It looked very precise.* *I liked to learn about how the machines work and how precise they are. I thought the best part was watching the big cnc machine cut tools extremely precise.* *I liked seeing all of the different tools and machines that people use in the shop. I also liked seeing and being in the environments to be able to see how things really work.*
Great Tour Guides	*All of the presenters were very professional.* *I liked the friendly people that gave the tour, as well as the different stations.* *I liked my tour guides they were very nice and helpful.* *Going on this tour I found out I liked the demonstration process and the passion that each of the workers showed.* *I love how the employees were so passionate about what they do and they truly enjoy their job* *The people were very specific with their explanations the people were very welcoming* *I like how friendly our tour guides were. I was also interested with the machinery and how they are computerized to carry out a daily task.* *The people working there were insightful and helpful.* *The workers were friendly and very informative.*

	I liked learning about what people do and how they apply engineering to their work. Everyone was really friendly and seemed to enjoy their work. *I liked most how the tour guide explained everything to us; they also answered all our questions.* *Being able to talk and interact with the engineering team.* *I liked the shop and how everything is organized. I also liked how the instructor answered all our questions and explained everything clearly.* *I also enjoyed the enthusiastic tour guides.* *I also liked how friendly and informational the guides were.* *The tour guide was good. I learned so much.* *The thing that I liked the most about this tour is how enthusiastic the guide was and how much information he gave us.* *Steve, our tour guide was informative and make one journey though each portion of the shop a learning experience.* *I liked that all of the tour guides and workers were very respectful and was telling us what everything was.* *I enjoyed being explained and showed things and parts by my guide, he was very nice and you could tell he liked his job.*

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