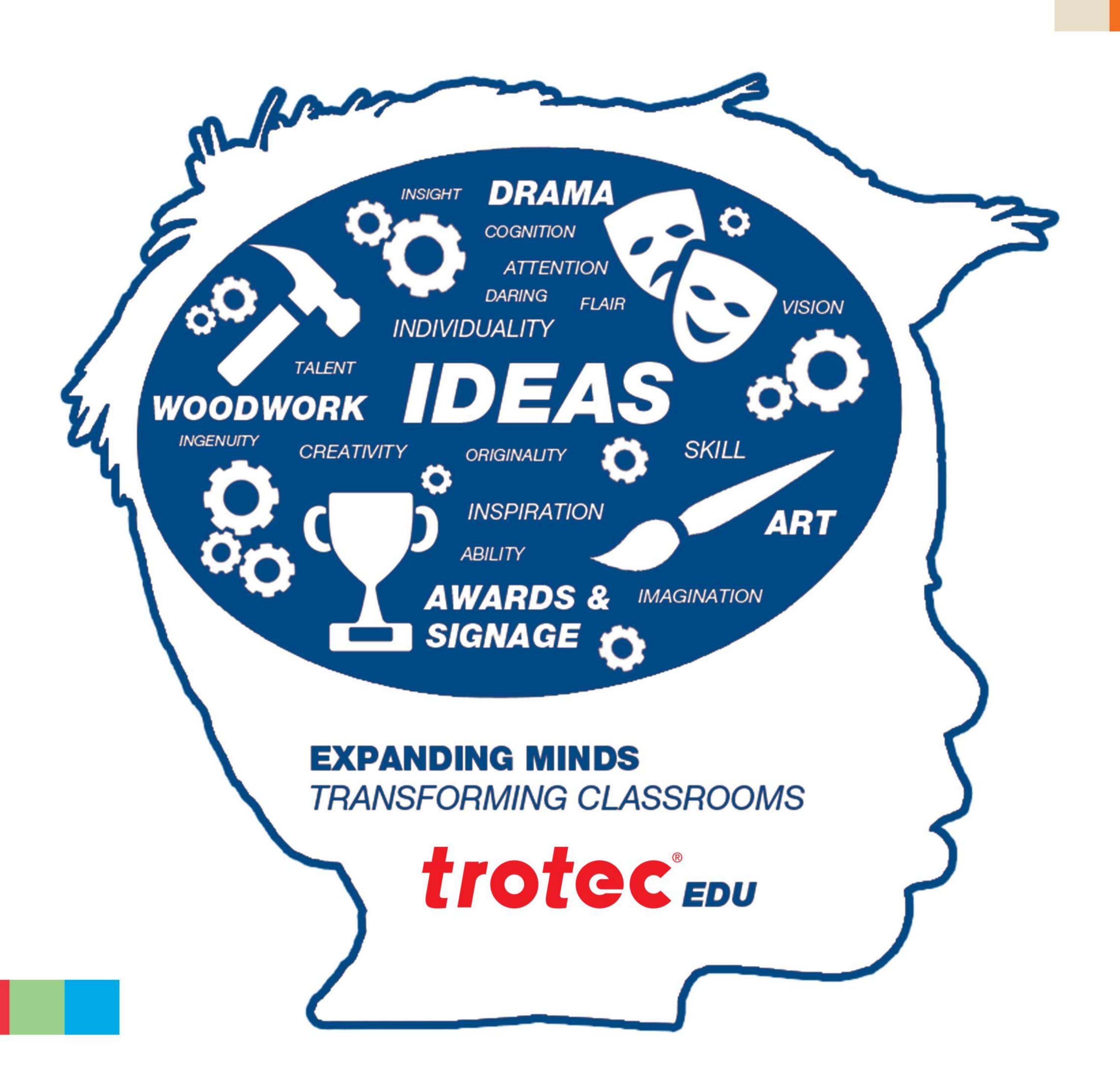


EDU Curriculum Guide







Personal and Project Management



It is expected the students will:

- Be able to read a requirements sheet and translate this into a working drawing for the design phase
- Identify the materials needed and the feasibility of engraving/cutting this material
- Be able to estimate the time and materials needed to produce a job from the requirements sheet
- Produce a sketch with dimensions of the final outcome
- Be able to produce folders and files in a way that helps find the jobs later
- Identify thickness of material for the design phase

Suggested Instructional Strategies

- Provide the students with a "customers' requirements" page that outlines what the customer needs in full detail. This could be in the form of a paragraph of bullet points.
- The students will be asked to quote time and material needed as well as a basic sketch of the project with dimensions
- Suggest students write out a bill of materials needed for the project
- Have students come up with a schedule for laser time
- Have students write up some processes that the laser engraver/cutter has replaced and how it made the process better
- Make a box with them using the Rhaulbotics box program to show how material thickness affects model

Suggested Assignment Strategies

- Write out five or six potential customer requests from 3D pieces to 2D signs and hand them randomly to groups to learn to work as a pre-design team. Once completed, assess their ability to come up with a bill of materials, a sketch of the piece, the dimensions, and the accuracy of the completed project
- Inspect each groups folder structure for saved jobs (company name/job name/file name) for the bill of materials, time estimation, and sketch
- In the early stages of the group project, assess the student's ability to work as a team, cooperate with differing opinions, make use of time. Have them assess their own work in a 5-point scale
- Have them answer some questions like: If a material is this thick, how thick should our tab be?

http://boxmaker.connectionlab.org/

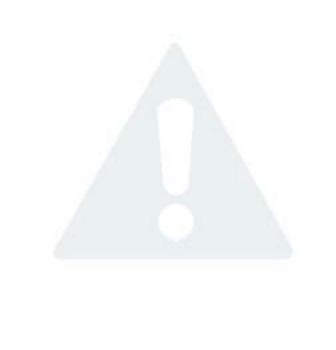
Designing A box in Inkscape https://www.youtube.com/watch?v=A1FII5Eq4PQ

Quoting a job with a laser http://www.sawmillcreek.org/showthread.php?179651-Laser-Cutting-Quote















Science and History



Prescribed Learning Outcomes

It is expected the students will:

- Know how a Co2 laser tube works
- Know who invented the laser
- Know the different types of lasers used in the industry
- Know the wavelength of the common laser types



Suggested Instructional Strategies

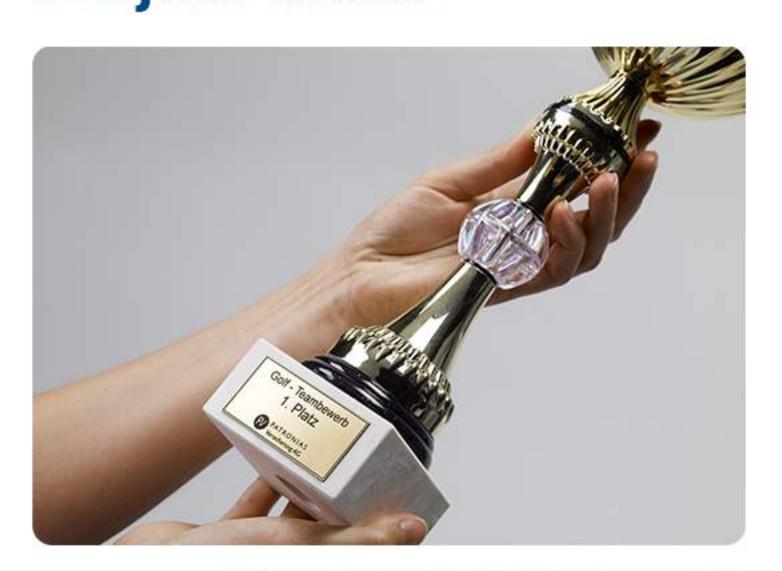
- A brief talk about the inventor of the Co2 laser and some dates of their milestones
- Show the different kinds of lasers
- Show a video on how the Co2 laser works



Suggested Assignment Strategies

• Multiple choice questions to assess understanding of the history and science for the laser





Trophies and awards



Wood/metal combinations



Electronics engraving



Glass engravings

Recommended Learning Resources

Co2 laser works http://en.wikipedia.org/wiki/Carbon_dioxide_laser

Different types of lasers http://en.wikipedia.org/wiki/List_of_laser_types









It is expected the students will:

- Learn to discern different types of plastics
- The difference between cast and extruded acrylic
- To judge ratios of speed and power for different materials
- Learn the difference between materials that can and cannot be cut
- Learn what is an unsafe material

Suggested Instructional Strategies

- In Commander, use the speed and power settings provided to cut and engrave a cross section of a material
- Mark some cast and extruded acrylics with the same power settings
- Scratch-and-sniff some vinyl, ABS, and acrylic to notice the different smells
- Try cutting plastic, wood, stone and metal, to establish each materials cutability
- Talk about how super-heated vinyl releases chlorine gas that mixes with moisture to make hydrochloric acid gas



Suggested Assignment Strategies

- Write up a "lab" report to have the class write their hypothesis
- Have the class write up what happened in each case and keep the paper in their laser book. This will be helpful for when they are making up their projects
- Test on what materials are cuttable, dangerous, toxic and flammable

Recommended Learning Resources

Trotec's job control program settings

Acrylic types

http://www.pmma.dk/Acryl_stobt_kontra_ekstruderet.aspx?Lang=en-GB

Lasing PVC

http://www.bofa.co.uk/lasingPVC.asp

Engraving materials

http://www.troteclaser.com/en-US/Materials/Pages/Material-Overview.aspx





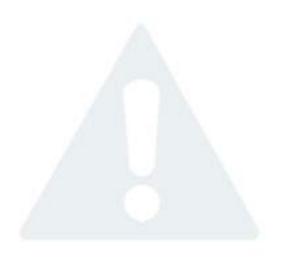
Supporting Tools



Prescribed Learning Outcomes

It is expected the students will:

- Learn to use digital calipers
- Learn to use paper mask for cutting and engraving
- Be able to identify marks on a ruler
- Identify what materials need magnets to hold down
- Be able to use tape to hold down material



Suggested Instructional Strategies

- Show each supporting tool on the bench and describe each one
- Show how masking can help aid in engraving and cutting
- Describe proper use of digital calipers
- Perform a job on veneer. This wood will need to be gauged with the calipers, coated with mask and held down by a magnet to the bed or taped



Suggested Assignment Strategies

- See how groups of students do with using the calipers to measure several pieces of material. Both in inches and mm
- The same groups have to successfully apply mask to some wood
- These same groups mark out several lines using mm, cm, and inches

Project Ideas



Writing utensils



Phone engraving



Jewelry



Coffee cups

Recommended Learning Resources

Using digital calipers

http://tresnainstrument.com/how_to_use_digital_calipers.html https://www.youtube.com/watch?v=Ceuh691Me_M

Applying paper mask https://www.youtube.com/watch?v=WSgPJZuVd3U









It is expected the students will:

- Know how to turn on and off the laser system properly
- How to check and clean the lens of the machine properly
- Know how to manually and automatiacally focus the machine
- know what to do in an emergency (fire, collision, hand-stuck)
- What to keep clean throughout the day



Suggested Instructional Strategies

- In groups, show students the proper sequence to turn on and off the machine, clean the lens and focus the machine
- Show the proper procedure for fire, collision, or a hand being stuck
- Clean the machine with each group



Suggested Assignment Strategies

- While following a checklist guide (that students will keep in their laser handbook), each student will go through the proper steps to make sure the proper readiness for engraving is reached
- Pop-quiz each student for an emergency and what to do in each case

Project Ideas



Paper greeting card



Architectural models



Clothing designs



Electronics engraving

Recommended Learning Resources

Trotec's Operation Guide http://www.troteclaser.com/en-US/Support/Documents/Speedy-300-Manual-EN.pdf



http://www.troteclaser.com/en-US/Support/Documents/JobControl-Manual-EN.pdf









It is expected the students will:

- Know how to set up their software for laser cutting/engraving
- Know to differentiate cutting tool paths with engraving lines
- How to set up their page for engraving on the right size laser bed
- What colours to use for different lasing operations

Suggested Instructional Strategies

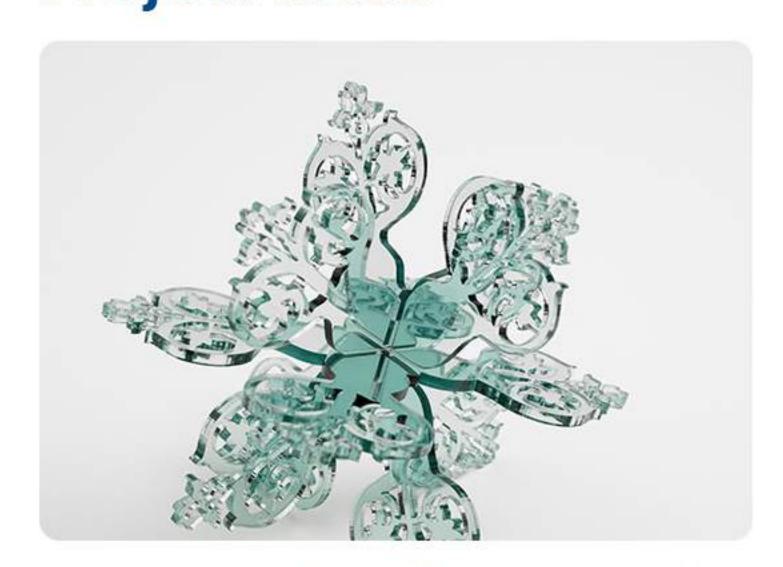
- Show lines on a page that are .003 (Hairline) and thicker lines, show the laser cut one and engrave another
- Show a small (4x4) page being cut on the larger bed
- Show an example of the most used software and how it is set up for engraving
- Describe why RGB colours must be used for lasers to know the difference in the objects, and apply different porperties to each
- Make some objects on a (laser bed) size sheet and show how you can move your objects around to cut while using that size, instead of laser piece size



Suggested Assignment Strategies

- From the Personal and Project Management section, have each of the groups produce their drawing on the screen using your preferred graphics software. Have each group practice the Hairline Cut / Thick Line Engrave technique
- Make sure each team uses 3 different engraving techniques

Project Ideas



Acrylic ornaments



Shelving units



Promotional items



Photo frames

Recommended Learning Resources

Trotec's Rayjet Commander software guide

Trotec's Rayjet user guide









It is expected the students will:

- Identify and understand Worksafe regulations for laser classes
- Understand the interlock system
- Identify the moving parts and when to stay clear
- Understand the potential dangers of lasers (burns, fires, materials, exhaust)

Suggested Instructional Strategies

- Health and safety training should always be taught first in the curriculum
- Engage in a discussion about the potential effects of a laser engraver on health
- Provide students with the Worksafe official laser-class designations
 - Discuss where one would find each class of laser
 - Explain the laser class of your laser and how it might be changed if safety is not followed
- Provide some photos of laser burns to demonstrate the need for proper safety
- Talk about the gasses involved in the cutting/engraving process
 - Talk about flammability, breathability and need for proper exhaust at all times
 - Show the class how to read a MSDS sheet and where to look for laser engravability

Suggested Assignment Strategies

- Use Multiple-choice questions to assess the student's knowledge of the Worksafe regulations, laser safety systems, danger areas, and potential hazards
- Put students into groups and have each group describe a material from an MSDS sheet and whether it is Laser friendly
- Have students write out a paragraph on a made-up accident (learned from that class) and how it could have been prevented

Recommended Learning Resources

Laser cutting PVC http://www.bclaserworks.com/pdf/lasercutpvc.pdf

How to find MSDS Sheets http://www.ilpi.com/msds/



Industrial Lasers can cause serious eye injuries and severe burns http://www.worksafebc.com/publications/high_resolution_publications/assets/pdf/laser_light_ws0607.pdf

Trotec Laser Safety

http://www.troteclaser.com/en-US-US/About-Trotec/News/Pages/2013-04-Laser-Safety.aspx

Trotec Exhaust

http://www.troteclaser.com/en-US/Laser-Machines/Accessories/Exhaust-Systems/Pages/Exhaust-Systems.aspx