

Applying the 13 Fundamental Concepts of Technology

Info in red font is for the benefit of the teacher (ideas for differentiated learning etc). Delete text in red font from the copies that are distributed to students. In a document / template that is intended to be "filled in" by students for assessment / evaluation purposes, the Version History table can be retained for students to use. Making an improved version 2 or 3 is great learning and should be encouraged. Show the class how easy it is to automatically generate and modify a Table of Contents using the features of the word processing technology. Because this unit is early in the course, significant review of fundamentals is included in the documents supporting this unit.

CC = Significant cross-curricular learning opportunity

Version History:

V #	Date	Author	Short Listing / Description of Changes
1	May 7/12	D.B. McCowan	Initial Version -- uploaded to OCTE Safety Portal
2			

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1 Expectations – Low-Order Information Processing

Design / Build a Marketable Picture Frame Using Scrap Wood Flooring	
1 Curriculum Expectation <i>In this unit the student will demonstrate / practise the following:</i>	2 Activity -- What You Will Do in this Lesson
B1.2 -- plan and organize projects and related activities using a design process and appropriate methods and tools	-use simple low-level information processing skills to connect or relate all 13 fundamental concepts of technology to the design and construction of wooden picture frames -this is a `first pass` at a list of Requirements or targets for the project

Table 1: Expectations

2 This Lesson is Important Because...

Everything around us is technology in one form or another. From a birds-eye point of view, practically all examples of technology are made up of some combination of only 13 fundamental concepts. If you practice "seeing" technology in terms of these fundamentals, your learning about technology will become much easier. After mastering the fundamentals, you will learn how to derive your own "new" concepts, based on the fundamentals.

3 Practice -- Apply the 13 Fundamental Concepts of Technology

You have already had a lesson regarding the thirteen fundamental concepts of technology. You already know what the 13 concepts are and what they basically mean. (Review the definitions if you wish). You probably have a few pictures in frames 'hanging around' in your home. Take a look at them if necessary.

Or you can complete the practice exercise below right now without looking up anything at all.

After all, "you already know more than you think you know". You will use your low-level information processing skills (recall, translate, interpret) to connect all 13 fundamental concepts of technology to the design and construction of wooden picture frames. Regardless, you will now practice looking at a product as if it was generally "made up of" the 13 fundamental concepts of technology.

Note to teacher:

Differentiated Learning Ideas	
Abbrev	Description / Notes
DL-L	For students with lower abilities -Give all of the teacher`s samples, as shown in in the table in green font. Encourage these students to read, understand and appreciate the teacher`s samples and then write their own interpretation for at least 3 or 4 of the concepts that are of most interest to the student.
DL-M	For students with moderate / mid-range abilities. This should generally be the default, always involving some level of critical thinking. -As for DL-L, but give these students only 6 of the teacher`s samples in green font – read, delete and then write their own interpretation (eg Sustainability, Energy, Structure, Fabrication, Material, Mechanism). They are to write their own interpretation for the remainder.
DL-H	For students with higher abilities or, ideally, "for any students who want to do more". -As for DL-M, but only give 3 of the teacher`s samples in green font -- Sustainability, Energy, Structure.

Then take up in class.

Fundamental Concept	An Initial General Definition** (For Your Convenience)	Student's Interpretation What Does This Concept Mean in the Context of a Picture Frame Made From Scrap Wood Flooring? Teacher Samples are in Green Font
Aesthetics	The aspects of a product, process, service or system that make it pleasing to the human senses.	Read the Teacher Sample, then delete it and write your own interpretation: The frame must look good enough that someone will buy it. The

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Fundamental Concept	An Initial General Definition** (For Your Convenience)	Student's Interpretation What Does This Concept Mean in the Context of a Picture Frame Made From Scrap Wood Flooring? Teacher Samples are in Green Font
		buyer may or may not have a particular picture in mind with which to use the frame. Regardless, the frame should enhance the aesthetic appeal of the picture.
Controls	The means by which a mechanism, device, process or a sub-system is activated and / or regulated.	Read the Teacher Sample, then delete it and write your own interpretation: The mechanism for hanging the frame on a wall must be such that the frame can easily be made level (horizontal).
Energy / Power	The resource that enables a mechanism to perform work. In its most general sense, energy is the capacity to “have an effect”. Power is how fast the work is getting done. Power is Energy divided by Time.	Read the Teacher Sample, then delete it and write your own interpretation: Our class will conserve energy by using hand tools to build our frames. In so doing, we will develop our hand skills.
Ergonomics	The design of a product, process, system or service in a way that takes the user’s well-being with respect to its use or delivery into account – that is, in a way that minimizes discomfort, risk of injury, and expenditure of energy. "User-Friendliness" is one simple way of viewing Ergonomics. We can liken Ergonomics to "Human Factors Engineering".	Read the Teacher Sample, then delete it and write your own interpretation: It must be easy for a person to install a photograph or other picture in the frame. The frame must be easy to hang on the wall. I will write installation instructions so that people will have no problems doing the installation.
Fabrication	The act or process of forming and assembling components and / or materials and resources to create a product, structure, system or service. We can liken Fabrication to "building" and "creating". Fabrication is a process that we can follow to yield a result.	Read the Teacher Sample, then delete it and write your own interpretation: The joints in the frame must be strong enough such that they will not loosen or fracture if the frame drops to the floor. The frame must be simple enough to build using hand tools in the school shop.
Function	The use for which a product, process, service or system is developed. Fitness for the intended purpose is very important.	Read the Teacher Sample, then delete it and write your own interpretation: The picture frame will protect a photograph or picture that is considered to be of some value to the owner. The frame must be able to securely hold a photograph or other picture in place and be equipped with additional parts that will enable the picture to be put on display.
Innovation	Original and creative thinking resulting in the effective design of a product or service. Innovation is a subset of "Problem-Solving", relying greatly on personal thinking skills and team collaboration.	Read the Teacher Sample, then delete it and write your own interpretation: We will be showing that scrap from a construction site has marketable value if creatively transformed into something else.
Material	Any substance, resource or item used in the creation of a product or system or in the delivery of a service. Note that "information" is a resource.	Read the Teacher Sample, then delete it and write your own interpretation: The frame must be made of either the oak or the ash pieces of flooring. Both ash and oak are hard tough woods.
Mechanism	An arrangement of connected parts that allows a component, product or system	Read the Teacher Sample, then delete it and write your own interpretation:

Fundamental Concept	An Initial General Definition** (For Your Convenience)	Student's Interpretation What Does This Concept Mean in the Context of a Picture Frame Made From Scrap Wood Flooring? Teacher Samples are in Green Font
	to work or function.	I'd like to make a picture frame that has a hinged back support so that it can sit on the coffee table at home.
Safety	The care and consideration required to ensure that the product, process, system or service will not cause harm. All workers must perform their work according to best practices which preserve health and minimize danger to life and property.	Read the Teacher Sample, then delete it and write your own interpretation: If I specify that glass should be used in front of the picture, I must design and build my frame very carefully to ensure that the glass pane will not fall out – falling glass can cut someone's toe off.
Structure	The essential physical or conceptual parts of a product, process, system or service, including the way in which the parts are constructed or organized	Read the Teacher Sample, then delete it and write your own interpretation: The frame must be rigid and must not change shape under normal conditions of use. The frame must be strong. We will assume that the buyer of our frame may want to frame an oil or acrylic on canvas. The canvas will be stretched on the frame, so we need our frames to be extra rigid.
Sustainability: Environmental and Socio-Economic	The creation of products or services and use of resources in a way that allows present needs to be met without compromising the ability of future generations to meet their needs. An important related concept is that of environmental stewardship – the acceptance of responsibility for the sustainable use and treatment of land and other natural resources.	Read the Teacher Sample, then delete it and write your own interpretation: We are making our frames out of scrap wood flooring that would probably otherwise go to a landfill site. The ash trees in North America are all dying because of the emerald ash borer, a beetle. Most of the ash wood is being burned, destroyed or just left to rot. This does not have to be. The ash wood can be heat treated to kill all stages of insect life and then used to make valuable products.
Systems	The combinations of interrelated parts (e.g. structures and / or mechanisms) that make up a whole and that may be connected with other systems.	Read the Teacher Sample, then delete it and write your own interpretation: The extra parts that are required to hold a picture and hang the frame on a wall must cost no more than \$5 per frame. The class must work as a collaborative team – a system – to get the necessary parts at a volume discount. Of course, the teacher will buy the parts, but you have to specify exactly what and where to buy them.

** These "definitions" are either from or derived from the Ontario Curriculum for Technological Education, 2009, Introduction.

Table 2: Thirteen Fundamental Concepts of Technology in Context

Congratulations! (That is, if you wrote your 13 interpretations in your own words!) By looking at a picture frame as the sum of 13 fundamental concepts of technology, you are well on your way to understanding how to design and build a good one. You now have a very preliminary list of targets or `Requirements` for your picture frame project. You will dig deeper in the next lesson.

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4 Safety Reminder

Falling glass can cut someone`s toe off.

5 Self and Peer Assessment

NOTE: In the feedback, the Peer Assessor must “make the student think” – not give the student the answer! Be sure to include comments justifying the assessment value that you are giving. Peer Assessor must put his / her comments in red font.

Assessor’s Name and Additional Notes:

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