**PROBLEM SOLVING CURRICULUM GUIDE:**

**A PROCESS-BASED APPROACH**

**FOR SECONDARY SCHOOLS**

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/groups/northeast-wisconsin-fab-lab/](http://www.curriki.com/groups/northeast-wisconsin-fab-lab/)

|  |  |
| --- | --- |
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**Introduction to Problem Solving**

The problem – solving process model is not new to the education world. Examples of problem solving activities can be found in classrooms around the world. Projects such as Moonbase America (2013) or FIRST robotics competitions (FIRST, 2016) are two of a myriad of examples. The Wisconsin Technology Education Association, a group of educators providing professional development for teachers, promotes students’ problem-solving and critical thinking skills on their website (<http://www.wtea-wis.org/wordpress/?page_id=22>).

What is new about problem solving is an interest to teach problem-solving skills using maker spaces, Fab Labs, and digital fabrication laboratories particularly to grow a talent pipeline in the state of Wisconsin. Wisconsin’s Economic Development Corporation (2018) is providing funding for lab equipment and support for curriculum development. Forty-three districts have received funding to acquire fab lab equipment over the past three years (Wisconsin Economic Development Corporation, 2018, May 1)

**Gershenfeld’s Foundational Ideas**

Neil Gershenfeld , the creator of fab labs, laid down six foundational ideas in his TED talk (2006) that can be used to inform the design of problem-solving curriculum for digital fabrication spaces as follows:

1. “You can’t separate digital fabrication by discipline . . .” (10:43 – 10:39 on reverse timer in TED talk)
2. “A kid needs to measure and modify the world, not just get information about it on a screen . . .” (6:35 – 6:31 on reverse timer in TED talk)
3. “. . . there’s really a fabrication and an instrumentation divide bigger than the digital divide. And the way you close it is not IT for the masses but IT development for the masses . . . (6:31 – 6:22 on reverse timer in TED talk)
4. The ultimate invention (related to Fab Labs is) . . . the social engineering (3:02 – 2:55 on reverse timer in TED talk)
5. “The real opportunity (of Fab Labs) is to harness the inventive power of the world to locally design and produce solutions to local problems (1:41 – 1:30 on reverse timer in TED talk).
6. “. . . in place after place we saw this same progression (see Figure 1) . . . (6:22 – 4:06 on reverse timer in TED talk)

Figure 1: Natural progression of Fab Lab activities

**Integrating Theory and Practice**

Gershenfeld’s (2006) foundational ideas are integrated with other processes, frameworks and theories to inform this process-based approach to curriculum design

**Community and Cultural Relevance**

The theme of community runs through the Fab Lab philosophy. Gershenfeld (2006) declares that fab labs are about social engineering and that the opportunity that fab labs present is to solve local problems within a local context. The idea that fab labs exist within a larger social context is reinforced by the Fab Foundation’s (2018) description of the community function in relation to Fab labs. The fab charter explicitly indicates that fab labs are a community resource (Center for Bits and Atoms/Massachusetts Institute of Technology (n. d.))

Fab labs are being integrated into rural, suburban and urban districts. Each of these districts has a different socio-economic profile and an accompanying culture offering different problems that might be addressed within a digital manufacturing context. One example is found in a rural northern Wisconsin town. Figure 2, on the following page, shows the cycle of young people’s rural flight from the community. This school district received funding to integrate a fab lab into their school. This district approached their rural flight issues as a social problem that could be addressed within the context of a digital fabrication space. The district started with a community audit and held focus groups with their students, business and industry leaders, teachers, parents, and local organizations. They began to recognize that economic development needed to be treated within the context of a broader social problem. Getting people to settle and stay in the area was about more than just employment. People wanted recreational opportunities, cultural events, access to health care, and more while maintaining the rural lifestyle they enjoyed. The district began to analyze how the Fab lab activities could be leveraged to meet these challenges. The fab lab, and associated activities, became the mechanism to change the existing mindset from rural flight to “stay and play”. Fab lab activities were used to help local businesses solve manufacturing problems while students learned technical skills to increase their employability. An entrepreneurship course was developed to help provide the support young people needed to start their own business in the local community. Non – profit organizations discussed ways the Fab lab might be used to support their work. Retirees talked of their passions and how the Fab lab might support their leisure activities and help promote the town. Curriculum developed in fab lab contexts was tied to ongoing student research informed by the Department of Natural Resources concerns about white nose bat syndrome.

Figure 2: Young people’s cycle of rural flight

This example, and the resulting impact on this curriculum guide, was informed by Kania and Kramer’s (2011) collective impact approach. The Fab lab addresses the social problem of rural flight using elements of the collective impact approach including the creation of a common agenda, mutually reinforcing activities, and having continuous communication elements in place.

The idea of a “culturally relevant” curriculum, a curriculum that is aligned to the local culture, was inspired by the Alaska Native Knowledge Network’s *Culturally-based curriculum resources.* The Alaska Native Knowledge Network resources developed a framework that identifies culturally-relevant themes spiraling through the K-12 setting. Additional insight regarding culturally-relevant curriculum was provided by Carol Amour of Creative Education Associates who took time to help me understand how the Alaska Native Knowledge Network idea might be adapted to explore digital fabrication laboratories in rural Wisconsin.

This curriculum, designed for the eleventh and twelfth grade level could be scaffolded and adapted to a spiraling framework similar to that of the Alaska Native Knowledge Network.

**No Distinct Discipline**

Individuals and fab lab communities go through the natural progression that Gershenfeld identifies (see Figure 1). The third step in this progression is problem solving. The progression is evident regardless of academic discipline (Gerhsenfeld, 2006 10:43 – 10:39 on reverse timer in TED talk) or learner demographics. Two strategies were implemented to address the universality of the problem-solving process in this problem-solving curriculum. First, the curriculum scaffolds students through learning a problem –solving/research skill framework (see Figure 3) developed by Willison and O’Regan (University of Adelaide, 2006). The framework is effective as the vertical axis of the framework describes research/problem solving skills irrespective of discipline. Teachers and students can step through the problem solving process as they tackle commonly known, commonly not known, or totally unknown problems (Willison& O’Regan, 2007). The horizontal axis of the framework describes students’ level of autonomy. It is useful for helping teachers identify how much student autonomy they are willing to provide students. The framework is effective because it can be applied across disciplines. It can be scaled to an individual assignment, a course, or a program. Utilizing the framework is essential for making the research process visible to students and teachers alike. It is an essential element used to design the teaching and evaluating problem solving as an explicit process.

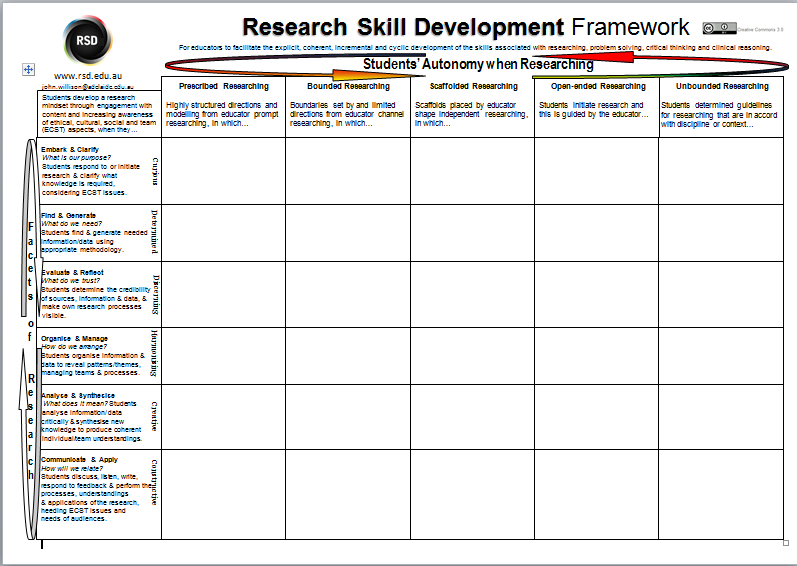


Figure 3: Research Skill Development Framework

The course calendar and the lessons developed in this curriculum document utilize Willison and O’Regan’s (2007) framework and explicitly indicates which research process is addressed.

While the problem-solving curriculum was adapted for a digital manufacturing laboratory, the problem-solving process can be employed regardless of discipline. In the real world problem solving is not categorized by discipline as problem solving is not a “siloed” activity. It is for this reason that this problem-solving curriculum document was linked to standards applicable across disciplines. Specifically the Wisconsin Standards for Literacy in All Subjects (Wisconsin Department of Public Instruction, 2011, September), Wisconsin Standards for Information and Technology Literacy (Wisconsin Department of Public Instruction, 2017), and Wisconsin Common Career and Technical Core Standards (Wisconsin Department of Public Instruction, 2013) were aligned with each lesson in units 1 through 3. It should also be noted that this curriculum document can be adapted for problem solving in any discipline(s) as the curriculum is process, not product, oriented. Cross-disciplinary applications are encouraged when and where possible.

**Addressing the Digital & Instrumentation Divides**

Gershenfeld (2006) references an IT (information technology) divide that is bigger than the digital divide in the context of Fab labs and computing. An analysis of Wisconsin’s Standards for Information and Technology Literacy (Wisconsin Department of Public Instruction, 2017) revealed numerous competencies aligned to information technology and digital literacy. This problem-solving curriculum can be implemented with little or no technology using hard copies of documents, pencil sketching, and the like. The curriculum specifically integrated assignments and activities that would increase students’ appropriate exploration and use of information technologies. Assessments of digital literacy is embedded into this curriculum.

**Learning Theory**

“A kid needs to measure and modify the world, not just get information about it on a screen . . .” (Gershenfeld, 2006). This statement provides insight into Gershenfeld’s philosophy into learning. Learners need to be engaged in the learning. Learners need to be manipulating their world.

This curriculum document, as does Gershenfeld’s statement, reflect ties to learning theory and makes assumptions about learners and teachers role in the execution of the curriculum. The curriculum is strongly influenced by the constructivist philosophy of Piaget, the constructionist philosophy of Papert, Vygotsky’s notion of proximal development, Bronfenbrenner’s Bioecological model of development and Knowles’ adult learning theory (andragogy). Table 1 below highlights some of the elements that inform this curriculum document (Learning Theories, 2005-2017).

|  |  |  |
| --- | --- | --- |
| Person | Theory | Major constructs |
| Urie Bronfenbrenner  <https://www.learning-theories.com/bronfenbrenners-bioecological-model-bronfenbrenner.html> | Bioecological Model | * Individuals interact with their environment over time. * Microsystems * Mesosystems * Exosystems * Macrosystems |
| McMaster University  <https://www.learning-theories.com/problem-based-learning-pbl.html> | Problem-Based Learning | * Utilizes real-world problems * No “right” answer * Problems are context specific * Students are self-directed, active learners   Teachers are facilitators |
| Seymour Papert  <https://www.learning-theories.com/educational-robotics-and-constructionism.html> | Constructionism | * Discovery learning * Tangible objects in real world * Making thinking visible * Teachers are facilitators |
| P21 & Others  <https://www.learning-theories.com/21st-century-skills-p21-and-others.html> | 21st Century Skills | * Traditional literacy skills * Digital literacy skills * Learning/innovation skills |
| Lev Vygotsky  <https://www.learning-theories.com/vygotskys-social-learning-theory.html> | Social Development Theory | * Social interaction plays a key role in learning * Learning involves a “more knowledgeable other” * Zone of proximal development * Learning occurs in sociocultural constructs |

This process-based, problem solving curriculum reflects the learning theories and philosophies with social interactions playing a role in many of the lessons and in the problem-solving project. Real-world problem solving lessons require students to become actively engaged in their own learning as teachers move into the role of the facilitator. Twenty-first century skills including traditional subjects and digital literacy and problem solving skills are frequently utilized. Tangible products help make students’ thinking visible.

**You’re Invited**

The process-based curriculum document presented here reflects an approach this author used to teach the problem-solving process in high school aerospace and engineering courses for over a decade. The process-based approach allowed students to work on authentic problems that varied by individual/team interest and changed each semester.

During the summer of 2017 and the summer of 2018 the *Collaborative Curriculum Models for Engaged Learning and Teaching* project was implemented with funding provided by the Oneida County Economic Development Corporation and the Wisconsin Economic Development Corporation. Participants in this summer workshop demonstrated that this process-based approach to problem solving was applicable to digital fabrication settings. During the workshop the participants developed some of the artifacts that are included in this document.

This curriculum document represents ONE way, not THE way, to teach problem-solving as a process. You are invited to use, modify, and adapt this document to your particular teaching style, facilities, and community contexts. This author requests that you acknowledge the author(s) of any of the work you use by citing them appropriately. Recognizing the support of the Oneida Economic Development Corporation and the Wisconsin Economic Development Corporation would also be appreciated. Assessment tools included in this document was done so with appropriate permissions. Please be sure to obtain appropriate permission for yourself.

A word version, for easy editing, will be available at the Northeast Wisconsin Fab CoP website <http://curikki.com/groups/northeast-wisconsin-fab-lab/>.

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**Problem Solving Syllabus – Teacher Edition**

**EXAMPLE WITH ASSESSMENT TOOLS AND REFERENCES – INSTRUCTOR COPY**

**Instructor: Your name here**

**Contact Information: phone/email**

**Dates: Month Day – Month Day, Year**

**Final assignment due on Month Day, Year**

# Grade Level: 10, 11, 12 Credit Hours: 1 Fee: None

**Materials Needed:** USB stick; Online/Cloud storage

# Prerequisite: Trustworthiness and adult-like behavior

**Course Description**

Are you interested in creating and making? Do you have a design idea to make your chores and work-life easier? Do you want to make a difference in your community? Process-Based Problem Solving allows you to explore personal areas of interest while engaging in problem solving, teamwork, and communication. Hone skills you will need in your future careers. See how your academic courses apply to the real world. Collaborate with your teacher, others from your class, your school, your community, and the world as you find solutions to a problem of your choice!

**Course Objectives – Students will:**

1. Effectively communicate digitally and in-person
2. Demonstrate problem solving skills
3. Demonstrate digital/information literacy
4. Work safely in a lab environment to prototype solutions
5. Reflect on personal growth
6. Accept calculated (and appropriate) educational risk-taking and failure as part of personal growth

**Course Outline**

# I. Introduction & Expectations (Course goals 1, 3, 5 & 6) 6 days

# A. Getting Acquainted

# B. Teacher Expectations

C. Lab Layout & Resources

# D. Learner Expectations

# E. Pre Assessment

# 

# II. Embark and Clarify (Course goals 1, 2 & 3) 8 days

1. Problem Solving Pentagon
2. Finding Viable Problems
3. Personal Experience
4. Friends/Family
5. School
6. Community
7. Online
   1. Competitions
   2. Citizen Science
   3. News
8. Work
9. Other
10. Problem Selection & Clarification
    1. Categorizing problems
    2. Narrowing options
    3. Qualifications Summary – Word Cloud
    4. Problem Selection
    5. Problem Clarification in Team Context

III. Organize and Manage (Course goals 1, 3, 5) 5 days

1. Selecting digital tools
2. Ethical and appropriate use of information
   1. Plagiarism
   2. COPPA
   3. Business/industry perspective
3. Using digital tools

IV. Find and Generate (Tools & Technologies for Solution Design) 22 days

(Couse goals 1,2, 3, 4, 5 & 6 ) – keep projects simple and have them set up and ready to execute. Students need experience loading and running files. This unit is fast-paced so consider having students choose 3 applications instead of all of them. Selection will also depend on types of machines in the lab and how many machines are available. Alter as necessary.

1. Communicating Ideas-2D/3D CAD
   1. Modeling Techniques with tools/technologies
   2. 2D Computer Aided Drafting
   3. 3D Computer Aided Drafting
2. 3D Printer
3. Laser Engraver
4. Vinyl Cutter
5. CNC Router
6. CNC Mill
7. Basic Programming/Electronics

V. Applying the Problem Solving Pentagon 42 days

(Course goals 1,2,3,4,5, & 6)

1. Problem Specification
2. Evaluating Credible Sources and Solutions
3. Brainstorm Solutions
4. Evaluate Solutions
5. Schedule Project Benchmark Dates
6. Applied Problem Solving

VI. Analyze & Synthesize - Prepare Final Project Dissemination 3 days

(Course goals 1, 2, 3, 5 & 6)

VII. Communicate and Apply Final Project Presentation 5 days

(Course goals 1, 2, 3 & 5)

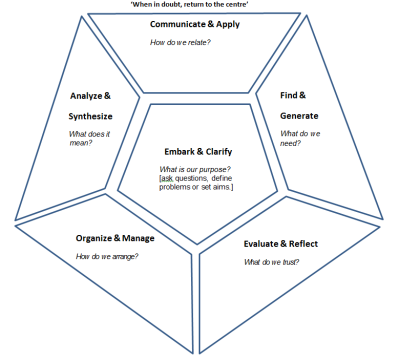
VIII. Post – Assessment & Reflection (Course goal 5, 6) 3 days (overlaps unit 7)

IX. Cleanup 1 day

**Tentative Schedule**

|  |  |  |
| --- | --- | --- |
|  | Topical Overview | Problem Solving Pentagon Skills |
| Week 1 | Course Introductions and Course Requirements |  |
| Week 2 | Introduction to Research Skills & Finding Problems | Embark & Clarify |
| Week 3 | Problem Selection & Clarification | Embark and Clarify |
| Week 4 | Selecting and Using Digital Tools | Organize & Manage |
| Week 5 | Communicating: 2D CAD/Vinyl Cutter | Find & Generate/Communicate & Apply |
| Week 6 | 3D CAD & 3D Printer/Laser Engraver | Find & Generate/Communicate & Apply |
| Week 7 | Laser Engraver/CNC Router | Find & Generate/Communicate & Apply |
| Week 8 | Electronic soldering in fabrication lab | Find & Generate/Communicate & Apply |
| Week 9 | Lab work/Problem clarification/Sources | Find & Generate/Communicate & Apply |
| Week 10 | Literature Review & Internet Search | Find & Reflect |
| Week 11 | Interview & Brainstorm | Find& Reflect/Generate & Evaluate |
| Week 12 | Thanksgiving break |  |
| Week 13 | Problem Solving Project | Find & Generate/Evaluate & Reflect  Analyze & Synthesize/Organize & Manage |
| Week 14 | Problem Solving Project | Find & Generate/Evaluate & Reflect  Analyze & Synthesize/Organize & Manage |
| Week 15 | Problem Solving Project | Find & Generate/Evaluate & Reflect  Analyze & Synthesize/Organize & Manage |
| Week 16 | Problem Solving Project | Find & Generate/Evaluate & Reflect  Analyze & Synthesize/Organize & Manage |
| Week 17 | Winter Break |  |
| Week 18 | Winter Break/ Problem Solving Project | Find & Generate/Evaluate & Reflect  Analyze & Synthesize/Organize & Manage |
| Week 19 | Problem Solving Project | Find & Generate/Evaluate & Reflect  Analyze & Synthesize/Organize & Manage |
| Week 20 | Prepare Project for Dissemination  5 minute digital portfolio | Analyze & Synthesize/Organize & Manage |
| Week 21 | Post Assessment & Reflection | Communicate & Apply |

Throughout the semester you will be using a non-linear problem solving process as shown on the Problem Solving Pentagon. The process utilizes 6 facets of problem solving as shown in the diagram below and referenced in the right column of the tentative schedule for the course.



From: University of Adelaide [**https://www.adelaide.edu.au/rsd/framework/simpler/**](https://www.adelaide.edu.au/rsd/framework/simpler/)

**Questions You Will Answer During the Semester-Long Problem Solving Process**

**Major Assignments & Weight - Modify to fit context**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Expert | Proficient | Competent | Beginner | Novice |
| Student Individual Performance  40% - Teacher Generated |  | | | | |
| Group Evaluation  10% - Teacher Generated |  | | | | |
| Denson/Buelin Assessment  10% Independent Review – Final |  | | | | |
| Other Miscellaneous  10% - Teacher Generated |  | | | | |
| Learning Growth  10% - Student Generated |  | | | | |
| Appropriate Educational Risk  10% - Student Generated |  | | | | |
| Information/Digital Literacy  10% Student Generated |  | | | | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Grade** | **Percentage** |  | **Grade** | **Percentage** |  |
| A | 93 – 100% | Expert | C | 73 – 76.99% | Competent |
| A- | 90 – 92.99% | C- | 70 – 72.99% |
| B+ | 87 – 89.99% | Proficient | D+ | 67 – 69.99% | Beginner |
| B | 83-86.99% | D | 63-66% |
| B- | 80 – 82.99% | D- | 60-62.99% |
| C+ | 77 -79.99% | Competent | F | <60 | Novice |

**Instructor’s Expectations:**

1. Respectful behavior (see RESPECT handout) is expected at all times.
2. Students will behave in a manner that promotes a safe work environment for all students.

Violation to this code:

1st time = Warning+

2nd time = Detention\* and 100 word safety report that is mailed home.

3rd time = Out of class until appropriate action with principal, parent, counselor, teacher, & student to discuss further participation.

1. Students will inform the teacher/ask permission to leave the classroom. ***Indicate appropriate policies for your room here.***
2. Students will bring the required materials to class and have them every day. ***Indicate any grading/ point implications here***
3. Please take notes and participate in class activities.
4. All work must be made up within 5 days of an absence. ***Insert your late work policy here***. (Exceptions will be made in special cases for extreme illness, hospitalization, etc. Those students with special concerns should make arrangements with the instructor – Talk to me!)
5. Questions regarding make-up work and assignments are best answered before school, immediately after school or by arrangement during the school day. Questions regarding missed assignments and make up work will be answered during class ONLY when it does not impact the learning of others in the class.
6. Please let me know about your individual needs (hearing loss, sight loss, reading difficulties, heavy workloads, after school sports, family obligations, medical conditions, etc.) during the FIRST WEEK OF CLASS. This will help me create the best possible learning environment for you as an individual.

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/imt/pdf/ITLStandardsFINALADOPTED.pdf](https://dpi.wi.gov/sites/default/files/imce/imt/pdf/ITLStandardsFINALADOPTED.pdf)

Wisconsin Department of Public Instruction (2013, May). Section III: Wisconsin common career technical standards. In *Wisconsin standards for technology and engineering* (pp 33 – 53). Retrieved from <https://dpi.wi.gov/sites/default/files/imce/cte/pdf/te_standards.pdf>

**Course Assessments – Used with Permission from the Authors**

**See Individual Items for Permissions**

# Student Individual Performance Rubric

Used with permission from Dr. R. Custer email on 22 June, 2018: rodney.custer@bhsu.edu

Custer, R., Valesey, B., Burke, B. (2001). An assessment model for a design approach to technological problem solving. *Journal of Technology Education, 12*(2). doi <https://doi.org/10.21061/jte.v12i2.a.1>

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Problem & Design Clarification** | | | | | |
|  | Expert | Proficient | Competent | Beginner | Novice |
| Examine context & define problem | Poses pertinent questions for clarification.  Identifies and prioritizes sub-problems (within the larger problem).  Explores context. | Poses questions.  Identifies sub-problems but does not prioritize.  Ignores context. | Asks some pertinent questions.  Identifies key content.  Defines problem adequately.  Ignores context. | Expresses limited knowledge of context or problem; problem is defined but needs clarification.  Asks questions but not pertinent and too few.  Ignores context.  Exhibits some indifference or frustration. | Tends to hone in on wrong problem, isolated subset, or easiest part to solve.  Begins to solve without clarification or questions.  Doesn’t see context.  Exhibits considerable indifference or frustration. |
| Develop, clarify, & negotiate constraints and criteria | Explains key constraints in detail.  Tries to negotiate or circumvent constraints.  Clarifies criteria prior to solving problem or posing solutions. | Clarifies constraints in detail; expresses their relationship to the problem solution.  Engages in limited negotiation of the constraints. | Clarifies constraints and accepts them as presented and understood. | Recognizes constraints but seeks minimal clarification. Accepts constraints as is.  Clarifies constraints late in design process as failures occur. | Does not identify constraints or criteria; does not grasp the significance of constraints.  Sees constraints as insignificant. |
| **Problem & Design Clarification (Continued)** | | | | | |
|  | Expert | Proficient | Competent | Beginner | Novice |
| Conduct research/ gather pertinent information | Consults several key sources.  Evaluates information; relates information back to problem and constraints.  Uses refined search strategies.  Researches sub-problems | Consults several key sources.  Uses observational techniques.  Cites references.  Ignores sub-problems. | Uses search guides and locates at least 2 sources.  Consults sources with some direction and/or organization. | Conducts very limited research.  Search restricted to easy-to- find and readily available resources. | Does not conduct research nor consult sources.  Starts solving problem without information. |
| **Develop a Design** | | | | | |
|  | Expert | Proficient | Competent | Beginner | Novice |
| Generate and visualize possible solutions | Generates creative and efficient solutions.  All solutions meet constraints and address the original problem.  Able to generate a number of different solutions.  Is innovative | Generates feasible solutions, but many are similar.  Meets constraints.  Uses resources efficiently.  Proposes creative solutions. Thinks “inside of the box”. | Generates solutions that meet most of constraints.  Establishes resources needed to implement solution.  Generates several possible solutions within constraints.  Thinks “inside the box.” | Identifies solutions that meet some of the constraints.  Some solutions are adequate to solve the problem.  Solutions may/may not be feasible.  Identifies single solution that meets constraints. | Cannot identify solutions *or* solutions are inappropriate to framed problem.  Does not appear to have an idea of where to begin.  Solutions are disconnected from, or totally ignore, constraints. |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Develop a Design (Continued)** | | | | | |
|  | Expert | Proficient | Competent | Beginner | Novice |
| Select a design solution | Provides detailed reasons for selecting solution.  Provides backup or alternate solution in case the first solution fails.  Attempts to be innovative and wants best possible solution.  Self-assured. | Selects solution on basis of efficiency and effectiveness.  Checks against constraints.  Provides basic rationale for selection.  Tends not to have an alternative solution in case the initial choice does not work. | Selects a reasonable solution based on criteria.  Solution meets constraints. | Selects solution with limited attention to criteria.  Can select solution.  Solution may or may not be feasible.  Is tentative and insecure in the selection process. | Selects solution according to personal preferences.  Unable to decide solution.  Solution may be unrealistic or impractical.  Uses few if any criteria to evaluate solutions.  Solution represents an easy way out. |
| Plan & communicate design | Develops detailed design plan, drawings, and sketches.  Devotes careful attention to constraints.  Continuously revisits and refines the solution.  Knows when to stop the refinement process. | Creates a plan with supporting technical drawings.  Maintains journal or log of daily activities.  Meets constraints. | Creates an organized plan with sufficient detail. Identifies basic tools, resources.  Visualizes using technical drawings.  Ignores some constraints. | Explains design plan, citing procedures, resources, and other requirements.  Visualizes using technical sketches without regard for scale.  Ignores key constraints. | Explains design in general terms and with little detail.  Sketches are rough and without sufficient detail. May attempt to move forward without drawings.  Ignores constraints. |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Model/Prototype** | | | | | |
|  | Expert | Proficient | Competent | Beginner | Novice |
| Select and use resources | Uses appropriate resources (i.e. tools, materials, and information) for developing and producing the solution.  Accesses a variety of information sources (websites, manuals, technicians, electronic catalogs, etc.).  Selects and adeptly uses resources. | Accesses and uses appropriate resources to solve the problem.  Exhibits  refined knowledge of tools, materials, and technological processes.  Uses resources confidently. | Selects and uses appropriate resources related to most aspects of the problem. Displays some difficulty in accessing information.  Selects appropriate tools for developing and producing the solution.  Search for resources is limited to few sources. | Selects a limited range of resources.  Some difficulty in choosing appropriate technological resources.  Needs guidance in safe use of resources. | Limited ability to select and use basic resources.  Selection of tools, materials, processes, and information may be inappropriate.  Selected resources may not be feasible due to lack of availability, need for expertise, or cost. |
| Develop a plan for producing a model/ prototype | Develops a well detailed plan with references to design constraints and criteria.  Includes testing and modification steps.  Incorporates quality control measures. | Develops a detailed and systematic plan.  Communicates information and processes needed to produce the model or prototype.  Incorporates testing as a procedural step. | Develops a plan with logical and sufficient steps to develop and produce a solution.  Plan needs quality control checkpoints. | Develops a plan with some gaps and insufficient steps to solve the problem.  Connection with design criteria and constraints is marginal. | Develops a plan that lacks coherence and departs from design constraints and criteria.  Plan contains gaps and does not flow logically.  Procedures lack necessary detail. |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Model/Prototype (Continued)** | | | | | | | | | |
|  | Expert | | | Proficient | | Competent | | Beginner | Novice |
| Produce model/  prototype | Is adept with tools and resources, making continual adjustments to "tweak" the model/prototype.  Demonstrates persistence with minor problems.  Enjoys the challenge of refinements. | | | Uses tools and resources without guidance.  Refines model to enhance appearance and capabilities. | | Uses tools and resources with little or no guidance.  May redo model/prototype parts to improve quality. | | Uses tools and resources with some guidance.  May have difficulty selecting appropriate resources.  Refines work, but may prefer to leave model as first produced. | Needs guidance in order to use resources safely and appropriately.  Crudely constructs model/prototype, with little or no refinement. |
| **Evaluate the Design Solution** | | | | | | | | | |
|  | | Expert | Proficient | | Competent | | Beginner | | Novice |
| Test and critique solution | | The solution fully meets the design constraints and criteria.  Specific improvement ideas are generated and documented. | The solution meets most of the design constraints and criteria.  Some general improvement ideas are generated and documented. | | The solution addresses some design criteria completely but ignores others.  Recognizes the need for improvement. Some ideas are generated, however only in concept.  Documentation is sketchy. | | The solution is only marginally connected with the design criteria.  Shows little interest in improving the solution. | | The solution fails to meet selected design criteria.  In spite of problems detected during testing, no effort is made to refine the solution. |
| **Evaluate the Design Solution (Continued)** | | | | | | | | | |
|  | | Expert | Proficient | | Competent | | Beginner | | Novice |
| Refine solution | | Solution is refined in a manner consistent with constraints and criteria.  Solution is in constant refinement, based on continuous data gathering. | Solution is refined in a manner consistent with constraints.  Changes represent some improvement to the quality and functionality of the solution. | | Solution is refined to be consistent with design constraints and criteria.  Refinements may be cosmetic and may not be significant. | | Some minor refinement of the original solution.  Refinements are primarily cosmetic in nature and contribute only marginally to the quality or effectiveness of the solution. | | Solution is accepted "as is".  Criteria and constraints are not referenced.  No data is collected to evaluate the solution. |
| Documentation/Technical Reporting | | All aspects of the design process are well-documented, including the processes used, design details, and resources.  Documentation package is well organized, highly reflective, technically accurate, and communicates effectively to others. | The design process is documented including the processes used, design details, and resources.  Drawings are technical and provide essential information  Documentation is fairly organized. Some insights concerning design changes and refinements are detailed. | | Documentation of design processes are factual and include all components.  Drawings are technical and provide essential information.  Reflections are limited to facts, with limited depth. | | Some attention to documentation with a preference for graphically depicting the design.  Little evidence of a clear organizational scheme.  Some design stages may not be documented. | | Little documentation is done of either the product design or of the design process.  Documentation is limited to hand-drawn sketches and sketchy, handwritten notes. |

**Group Evaluation Rubric**

**Name:**

Custer, R., Valesey, B., Burke, B. (2001). An assessment model for a design approach to technological problem solving. *Journal of Technology Education, 12*(2). doi <https://doi.org/10.21061/jte.v12i2.a.1> Permission for use obtained from Dr. R. Custer 22 July, 2018 ([Rodney.Custer@bhsu.edu](mailto:Rodney.Custer@bhsu.edu))

|  |  |
| --- | --- |
| All members of the group contributed actively to the process | 5 4 3 2 1 |
| The members achieved an appropriate balance between leadership and followership | 5 4 3 2 1 |
| All members contributed creative ideas to the process | 5 4 3 2 1 |
| The group was able to re-energize when the energy level dropped off | 5 4 3 2 1 |
| The group was able to critique its own work | 5 4 3 2 1 |
| There was a good balance between group and individual work | 5 4 3 2 1 |
| As a whole, the group was flexible and adaptable | 5 4 3 2 1 |
| The group generated many new ideas rather than prematurely selecting a single solution | 5 4 3 2 1 |
| The group was able to incorporate diverse personalities and ideas | 5 4 3 2 1 |
| The group had the ability to resolve adversity (ideas that didn’t work, frustration, etc.) | 5 4 3 2 1 |

# 5 – Absolutely true of this group

**4 – Described the group for the most part**

**3 – Description fit the group about half of the time**

**2 – Only marginally describes the group**

**1 – Does not describe the group at all**

Intolerance of Uncertainty Scale – Short Form (IUS-12)

The intolerance of Uncertainty Scale – Short From (IUS-12) will be administered as a pre-test at the beginning of the semester and again at the end of the semester. It is hypothesized that students who do not tolerate uncertainty well are less likely to take risks related to problem-solving and innovation. Teachers may want to use the measure to explore if class activities in problem solving changed students attitudes or if an intolerance of uncertainty may have had an impact on student learning.

The assessment, shown below, can be retrieved from: <http://www.midss.org/content/intolerance-uncertainty-scale-short-form-ius-12>



Carleton, R. N., Norton, M. A., & Asmundson, G. J. G. (2007). Fearing the unknown: A short version of the intolerance of uncertainty scale. Journal of Anxiety Disorders, 21, 105-117. doi: S0887-6185(06)00051-X [pii]10.1016/j.janxdis.2006.03.014 Retrieved from: <http://www.midss.org/content/intolerance-uncertainty-scale-short-form-ius-12>

All of the instruments submitted to the MIDSS are protected under the Creative Commons attribution non-commercial 3.0 license. The instrument cannot be used for commercial purposes without the author’s consent.

Intolerance of Uncertainty Scale – Scoring

**Prospective Anxiety: fear and anxiety based on future events**

Score

Item 1 \_\_\_\_\_\_\_

Item 2 \_\_\_\_\_\_\_

Item 4 \_\_\_\_\_\_\_

Item 5 \_\_\_\_\_\_\_

Item 8 \_\_\_\_\_\_\_

Item 9 \_\_\_\_\_\_\_

Item 11 \_\_\_\_\_\_\_

Total: \_\_\_\_\_\_\_\_

**Inhibitory Anxiety: uncertainty inhibiting action or experience**

Score

Item 3 \_\_\_\_\_\_\_

Item 6 \_\_\_\_\_\_\_

Item 7 \_\_\_\_\_\_\_

Item 10 \_\_\_\_\_\_\_

Item 12 \_\_\_\_\_\_\_

Total: \_\_\_\_\_\_\_\_

See the following article for scale and scoring development:

Carleton, R. N., Norton, M. A. P. J., Asmundson, G. J. G. (2007). Fearing the unknown: A short version of the intolerance of uncertainty scale. *Journal of Anxiety Disorders 21*(1), 105-117.

**Heppner & Peterson’s Problem Solving Inventory**

This inventory can be used as a pre- and post- problem solving inventory. Please obtain permission to use the inventory in your classroom. Permission was granted by the author to use the assessment in this document. Permission was granted to reproduce the assessment from the APA for a term of one year. If the instrument has been removed from electronic access, please use the following information to obtain the questions used in this problem solving inventory.

Directions for using Heppner & Peterson’s Problem Solving Inventory:

1. Gain access to Heppner & Peterson’s article through your local library/online. Heppner, P. P., & Petersen, C. H. (1982). The development and implications of a personal problem-solving inventory. *Journal of Counseling Psychology, 29*(1), 66-75. [doi:10.1037/0022-0167.29.1.66](https://doi.org/10.1037/0022-0167.29.1.66)
2. Refer to Table 1 for the questions used in the inventory.
3. Use the permissions area of the *Journal of Counseling Psychology* to request permission to use the assessment tool.
4. Seek permission to use the inventory and alter the introduction from Dr. P. Paul Heppner at [heppnerp@missouri.edu](mailto:heppnerp@missouri.edu)
5. Write an introductory paragraph introducing the assessment in the context which you are using the inventory.
6. Construct the inventory using a word processor or online testing site as per permission from the APA.

Dr. P Paul Heppner can be contacted at: [heppnerp@missouri.edu](mailto:heppnerp@missouri.edu)

# The Problem Solving Inventory

## Form B

P. Paul Heppner, Ph.D.

Used with permission of author 26 June, 2018

Note, the directions have been modified from the original format

**Directions:**  People respond to problems in different ways.  The statements on this inventory deal with how people react to problems in their day-to-day life.  The term “problems” refers to technical and creative problem solving that everyone experiences at times, such as having a car that won’t start, accessing the internet with browsers that don’t work, charging electronic devices when travelling, or learning how to work with new materials like fabric or clay.  Please respond to the items as honestly as possible so as to most accurately portray how you handle such technical problems. Your responses should reflect what you actually do to solve problems, not how you think you should solve them.  When you read an item, ask yourself: Do I ever behave this way? Please answer every item.

Read each statement and indicate the extent to which you agree or disagree with that statement, using the scale provided.  Mark your responses by circling the number to the right of each statement.

1. Strongly Agree
2. Moderately Agree
3. Slightly Agree
4. Slightly Disagree
5. Moderately Disagree
6. Strongly Disagree
7. When a solution to a problem has failed, I do not examine why it didn’t work.
8. When I am confronted with a complex problem, I don’t take the time to develop a strategy for collecting information that will help define the nature of the problem.
9. When my first efforts to solve a problem fail, I become uneasy about my ability to handle the situation.
10. After I solve a problem, I do not analyze what went right and what went wrong.
11. I am usually able to think of creative and effective alternatives to my problems.
12. After following a course of action to solve a problem, I compare the actual outcome with the one I had anticipated.
13. When I have a problem, I think of as many possible ways to handle it as I can until I can’t come up with any more ideas.
14. When confronted with a problem, I consistently examine my feelings to find out what is going on in a problem situation.
15. When confused about a problem, I don’t clarify vague ideas or feeling by thinking of them in concrete terms.
16. I have the ability to solve most problems even though initially no solution is immediately apparent.
17. Many of the problems I face are too complex for me to solve
18. When solving a problem, I make decisions that I am happy with later.
19. When confronted with a problem, I tend to do the first thing that I can think of to solve it.
20. Sometimes I do not stop and take time to deal with my problems, but just kind of muddle ahead.
21. When considering solutions to a problem, I do not take the time to assess the potential success of each alternative.
22. When confronted with a problem, I stop and think about it before deciding on a next step.
23. I generally act on the first ideal that comes to mind in solving a problem.
24. When making a decision, I compare alternatives and weigh the consequences of one against the other.
25. When I make plans to solve a problem, I am almost certain that I can make them work.
26. I try to predict the result of a particular course of action.
27. When I try to think of possible solutions to a problem, I do not come up with very many alternatives.
28. When trying to solve a problem, one strategy I often use is to think of past problems that have been similar.
29. Given enough time and effort, I believe I can solve most problems that confront me.
30. When faced with a novel situation, I have confidence that I can handle problems that may arise.
31. Even though I work on a problem, sometimes I feel like I’m groping or wandering and not getting down to the real issue.
32. I make snap judgements and later regret them.
33. I trust my ability to solve new and difficult problems.
34. I use a systematic method to compare alternatives and make decisions.
35. When thinking of ways to handle a problem, I seldom combine ideas from various alternatives to arrive at a workable solution.
36. When faced with a problem, I seldom assess the external forces that may be contributing to the problem.
37. When confronted with a problem, I usually first survey the situation to determine the relevant information.
38. There are times when I become so emotionally charged that I can no longer see the alternatives for solving a particular problem.
39. After making a decision, the actual outcome is usually similar to what I had anticipated.
40. When confronted with a problem, I am unsure of whether I can handle the situation.
41. When I become aware of a problem, one of the first things I do is try to find out exactly what the problem is.

PSI SELF-SCORING SHEET

Used with permission of author 26 June, 2018

Instructions:

Scoring the PSI is a matter of summing the responses to each item (1-6) for each of the three factors. The times constituting each factor are listed below.

1. The first step is to transfer your answers (1-6) for the inventory to each of the corresponding blanks on this scoring sheet.
2. Second, note that some items are worded negatively, and scoring of these items must be reversed. These items are indicated by asterisks, and are followed by an equal sign (=) and an additional blank. Thus, for these items, reverse the numbers in the following fashion on all of those items which have additional blanks.

1 = 6

2 = 5

3 = 4

4 = 3

5 = 2

6 = 1

1. Third, simply sum the responses together for each factor (being careful to add any reversed number). Record the factor score.
2. Finally, add the three factor scores for the PSI total score. Do not add the three filler items in any way.

Self-Scoring the PSI

Factor one: Problem Solving Confidence

5. \_\_\_\_\_ 24. \_\_\_\_\_

10. \_\_\_\_\_ 27. \_\_\_\_\_

11.\* \_\_\_\_\_ = \_\_\_\_\_ 33. \_\_\_\_\_

12. \_\_\_\_\_ 34.\* \_\_\_\_\_ = \_\_\_\_\_

19. \_\_\_\_\_ 35. \_\_\_\_\_

1. \_\_\_\_\_

# FACTOR 1 SCORE \_\_\_\_\_

# Factor two: Approach-Avoidance Style

1.\* \_\_\_\_\_ = \_\_\_\_\_ 16. \_\_\_\_\_

2.\* \_\_\_\_\_ = \_\_\_\_\_ 17.\* \_\_\_\_\_ = \_\_\_\_\_

4.\* \_\_\_\_\_ = \_\_\_\_\_ 18. \_\_\_\_\_

6. \_\_\_\_\_ 20. \_\_\_\_\_

7. \_\_\_\_\_ 21.\* \_\_\_\_\_ = \_\_\_\_\_

8. \_\_\_\_\_ 28. \_\_\_\_\_

13.\* \_\_\_\_\_ = \_\_\_\_\_ 30.\* \_\_\_\_\_ = \_\_\_\_\_

15.\* \_\_\_\_\_ = \_\_\_\_\_ 31. \_\_\_\_\_

**FACTOR 2 SCORE \_\_\_\_\_\_**

## Factor three: Personal Control

3.\* \_\_\_\_\_ = \_\_\_\_\_ 26.\* \_\_\_\_\_ = \_\_\_\_\_

14.\* \_\_\_\_\_ = \_\_\_\_\_ 32.\* \_\_\_\_\_ = \_\_\_\_\_

25.\* \_\_\_\_\_ = \_\_\_\_\_

**FACTOR 3 SCORE \_\_\_\_\_**

**Filler items (Do Not Include in Scoring)**

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

**TOTAL PSI SCORE \_\_\_\_\_**

**Denson, Buelin, Lammi & D’Amico Assessment of Final Project – Online Version**

Denson, C. D. , Buelin, J. K. Lammi, M. D., & D’Amico, S. (2015, Fall). Developing instrumentation for assessing creativity in engineering design. Journal of Technology Education 27(1), pp 23-40. Retrieved from <https://eric.ed.gov/?id=EJ1087892>.

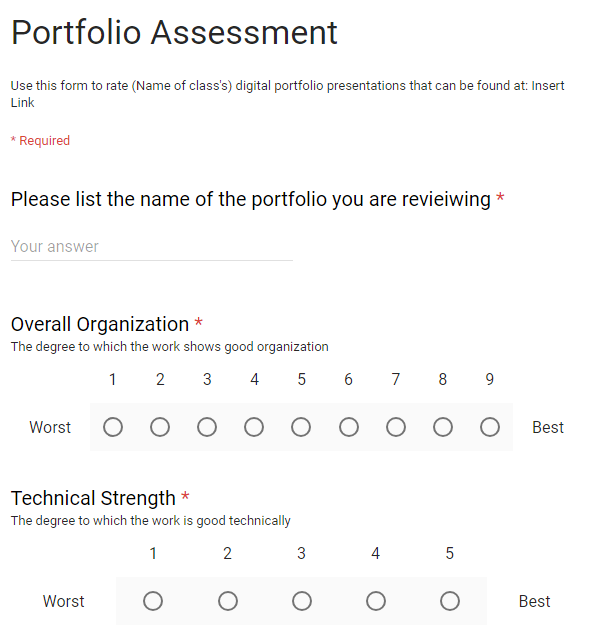
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1. Read Denson, Buelin, Lammi, & D’Amico’s article for assessment procedure and questions. Attend to sliding scale response layout for questions.



1. Use Google forms (<https://zapier.com/learn/google-sheets/how-to-use-google-forms/>) or other survey tool to create a similar survey that is accessible to your chosen group of portfolio evaluators. For example a rating scales from 1 (worst) to 9 (best) for the is available in Google Forms. Use the assessment tool to allow raters to provide feedback on the following 11 items:
   1. Overall organization [*The degree to which the work shows good organization*]
   2. Technical strength [*The degree to which the work is good technically.*]
   3. Neatness [The amount of neatness shown in the work.]
   4. Complexity *[The level of complexity of the design.]*
   5. Novel use of materials *[Degree to which the use of materials is unique and interesting.]*
   6. Overall aesthetic appeal *[In general, the degree to which the design is aesthetically appealing.]*
   7. Pleasing use of color and/or value *[The degree to which the design shows a pleasing use of color and/or value.]*
   8. Effort evident *[The amount of effort that is evident in the product.]*
   9. Novel idea *[Degree to which the design explores a unique and interesting idea.]*
   10. Pleasing use of shape/form *[The degree to which there is a pleasing use of shape/form in the design.]*
   11. Creativity *[Using your own subjective definition of creativity, the degree to which the design is creative.]*
   12. Liking *[Your own subjective reaction to the design; the degree to which you like it.]*

**Example of assessment tool using Google Forms**



|  |  |
| --- | --- |
|  |  |

**Denson, Buelin, Lammi & D’Amico Assessment of Digital Portfolio – Hard Copy/Slider Scale**

Denson, C. D. , Buelin, J. K. Lammi, M. D., & D’Amico, S. (2015, Fall). Developing instrumentation for assessing creativity in engineering design. Journal of Technology Education 27(1), pp 23-40. Retrieved from <https://eric.ed.gov/?id=EJ1087892>. Used with permission of authors (July 1, 2018)

Used to assess students’ 5 minute digital portfolio presentation assessed by outside evaluators

1. Overall organization – you work shows good organization

Worst 1--------2--------3--------4--------5--------6--------7--------8--------9 Best

1. Technical strength – work is good technically

Worst 1--------2--------3--------4--------5--------6--------7--------8--------9 Best

1. Neatness - The amount of neatness shown in the work.

Worst 1--------2--------3---------4--------5--------6--------7--------8--------9 Best

1. Complexity of the design

Worst 1--------2--------3---------4--------5--------6--------7--------8--------9 Best

1. Novel Use of material

Worst 1--------2--------3---------4--------5---------6--------7--------8--------9 Best

1. Overall aesthetic appeal

Worst 1--------2--------3---------4--------5--------6--------7--------8--------9 Best

1. Pleasing use of color and/or value

Worst 1--------2--------3---------4--------5--------6--------7--------8--------9 Best

1. Effort evident

Worst 1--------2--------3---------4--------5--------6--------7--------8--------9 Best

1. Novel idea

Worst 1--------2--------3---------4--------5--------6--------7--------8--------9 Best

1. Pleasing Use of shape/form

Worst 1--------2--------3---------4--------5--------6--------7--------8--------9 Best

1. Creativity

Worst 1--------2--------3---------4--------5--------6--------7--------8--------9 Best

1. Liking

Worst 1--------2--------3---------4--------5--------6--------7--------8--------9 Best

**Sample Semester Calendar for 2018 (example to be modified for current semester & year)**

**September**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Monday** | **Tuesday** | **Wednesday** | **Thursday** | **Friday** |
| = activities tied to research skill frameworks articulated by Willison & O’Regan  <https://www.adelaide.edu.au/rsd/> and the OPS at: [https://www. adelaide.edu.au/rsd/framework /frameworks/ops\_rev5.pdf](https://www.adelaide.edu.au/rsd/framework/frameworks/ops_rev5.pdf) | September 4 – Day 1  “Getting to Know You”  Individual introductions | September 5 – Day 2  Teacher Expectations  Syllabus overview | September 6 – Day 3  Lab Layout and Resources | September 7 – Day 4  Learner Expectations |
| September 10 – Day 5  Learner Expectations | September 11 – Day 6  Pre-assessment data collection | September 12 – Day 7  Embark & Clarify  Introducing: Optimizing Problem Solving Pentagon  Hiking Wisconsin Activity or similar | September 13 – Day 8  Embark & Clarify  Viable problems - post  *Find Your One Video*  Personal experience  Friends/Family | September 14 – Day 9  Embark & Clarify  Grading – Rubric/Self  Problem Detective Class Challenge  Viable Problems – News, Work, Community |
| September 17 – Day 10  Embark & Clarify  Viable problems – School, Competitions, Citizen Science | September 18 – Day 11  Embark & Clarify    Problem Selection  Categorizing  Narrowing Options  Qualifications Word Cloud | September 19 – Day 12  Embark & Clarify  Problem Selection  Decision Matrix  – Pugh Method | September 20 – Day 13  Embark & Clarify  Qualifications Word Cloud  Decision Matrix  Assessment & Reflection | September 21 – Day 14  Embark & Clarify  Problem Selection  Team Selection  Team identity |
| September 24 – Day 15  Organize & Manage  Selecting digital tools  - Class  - Group  - Individual  . | September 25 – Day 16  Organize & Manage  Selecting digital tools  Student exploration  Determining access | September 26 – Day 17  Organize & Manage  Ethical & Appropriate Use  Plagiarism  COPPA  Business/Industry perspective | September 27 – Day 18  Organize & Manage  Using digital tools  Self-instruction  Peer Teach  Instructor help | September 28 – Day 19  Organize & Manage  Using digital tools  Self-instruction  Peer Teach  Instructor help |

**October**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Monday** | **Tuesday** | **Wednesday** | **Thursday** | **Friday** |
| October 1 – Day 20  Find & Generate  Communicate & Apply  CAD programs – 2D & 3D  Machines as printers  File output | October 2 – Day 21  Find & Generate  Communicate & Apply  Introduce CorelDRAW or other (experience)  Team Logo for T-Shirt | October 3 – Day 22  Find & Generate  Communicate & Apply  CorelDraw/other 2D tutorial/practice with T-shirt logo | October 4 – Day 23  Find & Generate  Communicate & Apply    Vinyl Cutter – Intro-Safety  Assign safety test(s)  Demo Vinyl Cutting  Paint or heat transfer | October 5 – Day 24  Find & Generate  Communicate & Apply    T-shirt logo work day  Safety test completion  Vinyl cutter work day |
| October 8 – Day 25  Find & Generate  Communicate & Apply      Introduction to TinkerCAD  or other (experience dependent)  TinkerCAD tutorial | October 9 – Day 26  Find & Generate  Communicate & Apply    TinkerCAD keychain tutorial  Draw/Design a Keychain | October 10 – Day 27  Find & Generate  Communicate & Apply      3D printer – Intro – Safety  Assign safety tests  Demonstrate loading files and printing | October 11 – Day 28  Find & Generate  Communicate & Apply    Keychain work day  Safety test completion  3D printing  2D drawing and laser engraver workday | October 12 – Day 29  Find & Generate  Communicate & Apply    Laser engraver safety  Assign safety test  Laser engraver demo  Laser engraver project |
| October 15 – Day 30  Find & Generate  Communicate & Apply    Laser engraver work day | October 16 – Day 31  Find & Generate  Communicate & Apply    Lab work day | October 17 – Day 32  Find & Generate  Communicate & Apply    CNC Router demonstration  Assign CNC router safety | October 18 – Day 33  Find & Generate  Communicate & Apply    CNC safety test completed  CNC router workday | October 19 – Day 34  Find & Generate  Communicate & Apply    CNC router workday |
| October 22 – Day 35  Find & Generate  Communicate & Apply    Mini mill circuit demo  Assign mini-mill safety | October 23 – Day 36  Find & Generate  Communicate & Apply    Mini mill safety complete  Mini mill work day | October 24 – Day 37  Find & Generate  Communicate & Apply    Soldering demo  Assign soldering safety | October 25 – Day 38  Find & Generate  Communicate & Apply    Soldering Safety complete  Soldering workday | October 26 – Day 39  Find & Generate  Communicate & Apply    Lab workday |

**October – November**

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| --- | --- | --- | --- | --- |
| **Monday** | **Tuesday** | **Wednesday** | **Thursday** | **Friday** |
| October 29 – Day 40  Find & Generate  Communicate & Apply      Lab workday | October 30 – Day 41  Find & Generate  Communicate & Apply      Lab workday | October 31 – Day 42  Problem specification    Learners clarify and refine selected problem to manageable level and resources | November 1 – Day 43  Communicate & Apply      Create design problem brief | November 1 – Day 44  Communicate & Apply      Evaluating credible sources |
| November 5 – Day 45  Find & Reflect      Literature Review | November 6 – Day 46  Find & Reflect      Literature Review | November 7 – Day 47  Find & Reflect      Internet search | November 8 – Day 48  Find & Reflect      Internet search | November 9 – Day 49  Find & Reflect      Safe and appropriate contact and interview techniques/questions  - Phone  - Email |
| November 12 – Day 50  Find & Reflect      Interviews | November 13 – Day 51  Find & Reflect      Interviews | November 14 – Day 52  Generate & Evaluate      Brainstorm rules  Brainstorm solutions | November 15 – Day 53  Generate & Evaluate    Brainstorms solutions | November 16 – Day 54  Generate & Evaluate    Evaluation techniques  Evaluate solutions  Decision matrix |
| November 19  Thanksgiving Break | November 20  Thanksgiving Break | November 21  Thanksgiving Break | November 22  Thanksgiving Break | November 23  Thanksgiving Break |

**November - December**

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| --- | --- | --- | --- | --- |
| **Monday** | **Tuesday** | **Wednesday** | **Thursday** | **Friday** |
| November 26 – Day 55  Generate & Evaluate    Evaluate solutions | November 27 – Day 56  Communicate & Apply    Divide work and create schedule of work assignments | November 28 – Day 57  Find & Reflect  Generate & Evaluate  Analyze & Synthesize  Organize & Manage  Work independently/in groups on selected project | November 29 – Day 58  Find & Reflect  Generate & Evaluate  Analyze & Synthesize  Organize & Manage  Work independently/in groups on selected project | November 30 – Day 59  Find & Reflect  Generate & Evaluate  Analyze & Synthesize  Organize & Manage  Work independently/in groups on selected project |
| December 3 – Day 60  Find & Reflect  Generate & Evaluate  Analyze & Synthesize  Organize & Manage  Work independently/in groups on selected project | December 4 – Day 61  Find & Reflect  Generate & Evaluate  Analyze & Synthesize  Organize & Manage  Work independently/in groups on selected project | December 5 – Day 62  Find & Reflect  Generate & Evaluate  Analyze & Synthesize  Organize & Manage  Work independently/in groups on selected project | December 6 – Day 63  Find & Reflect  Generate & Evaluate  Analyze & Synthesize  Organize & Manage  Work independently/in groups on selected project | December 7 – Day 64  Find & Reflect  Generate & Evaluate  Analyze & Synthesize  Organize & Manage  Work independently/in groups on selected project |
| December 10 – Day 65  Find & Reflect  Generate & Evaluate  Analyze & Synthesize  Organize & Manage  Work independently/in groups on selected project | December 11 – Day 66  Find & Reflect  Generate & Evaluate  Analyze & Synthesize  Organize & Manage  Work independently/in groups on selected project | December 12 – Day 67  Find & Reflect  Generate & Evaluate  Analyze & Synthesize  Organize & Manage  Work independently/in groups on selected project | December 13 – Day 68  Find & Reflect  Generate & Evaluate  Analyze & Synthesize  Organize & Manage  Work independently/in groups on selected project | December 14 – Day 69  Find & Reflect  Generate & Evaluate  Analyze & Synthesize  Organize & Manage  Work independently/in groups on selected project |
| December 17 – Day 70  Find & Reflect  Generate & Evaluate  Analyze & Synthesize  Organize & Manage  Work independently/in groups on selected project | December 18 – Day 71  Find & Reflect  Generate & Evaluate  Analyze & Synthesize  Organize & Manage  Work independently/in groups on selected project | December 19 – Day 72  Find & Reflect  Generate & Evaluate  Analyze & Synthesize  Organize & Manage  Work independently/in groups on selected project | December 20 – Day 73  Find & Reflect  Generate & Evaluate  Analyze & Synthesize  Organize & Manage  Work independently/in groups on selected project | December 21 – Day 74  Find & Reflect  Generate & Evaluate  Analyze & Synthesize  Organize & Manage  Work independently/in groups on selected project |

**December - January**

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| --- | --- | --- | --- | --- |
| **Monday** | **Tuesday** | **Wednesday** | **Thursday** | **Friday** |
| December 24  Winter Break | December 25  Winter Break | December 26  Winter Break | December 27  Winter Break | December 28  Winter Break |
| December 31  Winter Break | January 1  Winter Break | January 2 – Day 75  Find & Reflect  Generate & Evaluate  Analyze & Synthesize  Organize & Manage  Work independently/in groups on selected project | January 2 – Day 76  Find & Reflect  Generate & Evaluate  Analyze & Synthesize  Organize & Manage  Work independently/in groups on selected project | January 2 – Day 77  Find & Reflect  Generate & Evaluate  Analyze & Synthesize  Organize & Manage  Work independently/in groups on selected project |
| January 7 – Day 78  Find & Reflect  Generate & Evaluate  Analyze & Synthesize  Organize & Manage  Work independently/in groups on selected project | January 2 – Day 79  Find & Reflect  Generate & Evaluate  Analyze & Synthesize  Organize & Manage  Work independently/in groups on selected project | January 2 – Day 80  Find & Reflect  Generate & Evaluate  Analyze & Synthesize  Organize & Manage  Work independently/in groups on selected project | January 2 – Day 81  Find & Reflect  Generate & Evaluate  Analyze & Synthesize  Organize & Manage  Work independently/in groups on selected project | January 2 – Day 82  Find & Reflect  Generate & Evaluate  Analyze & Synthesize  Organize & Manage  Work independently/in groups on selected project |
| January 14 – Day 83  Find & Reflect  Generate & Evaluate  Analyze & Synthesize  Organize & Manage  Work independently/in groups on selected project | January 15 – Day 84  Analyze & Synthesize  Organize & Manage  Prepare final project for dissemination - 5 minute digital presentation | January 16 – Day 85  Analyze & Synthesize  Organize & Manage  Prepare final project for dissemination – 5 minute digital presentation | January 17 – Day 86  Analyze & Synthesize  Organize & Manage  Prepare final project for dissemination – 5 minute digital presentation | January 18 – Day 87  Communicate & Apply  Final project – digital presentation/assessment  Post online for external review  Teachers assess portfolios  Students self –assess learning growth, digital literacy, educational risk |

**January**

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| --- | --- | --- | --- | --- |
| **Monday** | **Tuesday** | **Wednesday** | **Thursday** | **Friday** |
| January 21 – Day 88  Communicate & Apply  External reviewers review work  Students take post-course assessments | January 22 – Day 89    Post – test data analysis  Students compare pre- and post- test results.  Discuss growth during the semester | January 23 – Day 90  Post – test data reflection  Students Reflect and Discuss learning growth from pre- to post - | January 24 – Day 91  End of Quarter 2  End of Semester 1  Clean up/lab maintenance | Start New Semester |

| **Wisconsin Reading Standards for Literacy in All Subjects\* (Reading)**  **Grades 11-12**  \*Please see standards at [https://dpi.wi.gov/sites/default/files /imce/standards/pdf/las-stds.pdf](https://dpi.wi.gov/sites/default/files/imce/standards/pdf/las-stds.pdf) for detailed description and explanation. | Cite textual evidence supporting analysis of sources. Connect understandings | Determine central ideas, provide accurate summaries, establish relationships | Evaluate explanations, determine best fit with evidence and identify uncertainties | Determine meaning of words/phrases in context of whole text | Analyze structure of primary sources and contributions to whole of text. | Evaluate and assess author’s claims, reasoning and evidence | Integrate and evaluate multiple sources of information in diverse format | Evaluate author’s claims & evidence by challenging with additional information | Integrate information from diverse sources noting discrepancies | Read /comprehend social studies texts in the 11-CCR complexity band |  | Cite textual evidence supporting science and technical texts noting inconsistencies | Determine central ideas, summarize complex concepts/processes/information | Follow complex multistep procedures used in scientific /technical tasks | Determine meaning of symbols, key terms and domain-specific contexts | Analyze how information is categorized and structured for presenting ideas | Analyze author’s explanations and identify unresolved issues | Integrate and evaluate multiple sources of information presented in multiple formats | Evaluate hypotheses, data, analysis and conclusions. Verify or challenge ideas. | Synthesize information from a range of sources. Resolve conflicting information. | Read /comprehend science/technical texts in the 11-CCR complexity band |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Lesson: | RH - 1 | RH - 2 | RH-3 | RH -4 | RH-5 | RH-6 | RH-7 | RH-8 | RH-9 | RH-10 |  | RST- 1 | RST- 2 | RST-3 | RST-4 | RST-5 | RST-6 | RST-7 | RST-8 | RST-9 | RST-10 |
| Getting Acquainted Unit 1/Lesson 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Teacher Expectations  Unit 1/Lesson 2 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Lab Layout & Resources Unit 1/Lesson 3 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Learner Expectations  Unit 1/Lesson 4 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Pre Assessment Unit 1/Lesson 5 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Problem Solving Pentagon  Unit 2/Lesson 6 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Identifying Relevant Issues  Friends & Family  Unit 2/Lesson 7 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Identifying Relevant Issues Community  Unit 2/Lesson 8 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Categorizing and Narrowing Options  Unit 2/Lesson 9 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Decision Matrix Unit 2/Lesson 10 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Problem Selection & Team Context  Unit 2/Lesson 11 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Selecting Digital Tools  Unit 3/Lesson 12 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Ethical and Appropriate Use  Unit 3/Lesson 13 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Using Digital Tools  Unit 3/Lesson 14 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

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| **Wisconsin Writing Standards for Literacy in All Subjects\* (Writing) & (Speaking & Listening)**  **Grades 11-12**  \*Please see standards at [https://dpi.wi.gov/sites/default/files/imce/standards /pdf/las-stds.pdf](https://dpi.wi.gov/sites/default/files/imce/standards/pdf/las-stds.pdf) for detailed description and explanation. | Write arguments focused on discipline-specific content | Write informative/explanatory texts as appropriate for a specific discipline | Not applicable as separate requirement | Produce clear and coherent writing appropriate to task/purpose/audience | Develop and strengthen writing through various revision/improvement techniques | Use technology to produce, publish, update, edit individual/shared writing. | Conduct short & sustained research to answer question/solve problem | Gather relevant information for authoritative sources & cite correctly | Draw evidence from informational texts to support analysis/reflection/research | Write routinely over extended period for a range of disciplines/purposes/audiences |  | Initiate/participate in a range of collaborative discussions | Integrate multiple sources of information in diverse formats to problem solve and make decisions. | Evaluate a speakers’ point of view, reasoning and use of evidence | Present information, findings, and supporting evidence clearly | Make strategic use of digital media | Adapt speech to a variety of contexts and tasks. |
| Lesson: | WHST - 1 | WHST - 2 | WHST -3 | WHST -4 | WHST -5 | WHST -6 | WHST -7 | WHST -8 | WHST -9 | WHST -10 |  | SL - 1 | SL - 2 | SL -3 | SL -4 | SL -5 | SL -6 |
| Getting Acquainted Unit 1/Lesson 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Teacher Expectations Unit 1/Lesson 2 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Lab Layout & Resources Unit 1/Lesson 3 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Learner Expectations Unit 1/Lesson 4 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Pre Assessment Unit 1/Lesson 5 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Problem Solving Pentagon Unit 2/Lesson 6 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Identifying Relevant Issues  Friends & Family Unit 2/Lesson 7 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Identifying Relevant Issues  Community Unit 2/Lesson 8 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Categorizing and Narrowing Options  Unit 2/Lesson 9 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Decision Matrix Unit 2/Lesson 10 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Problem Selection & Team Context Unit 2/Lesson 11 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Selecting Digital Tools Unit 3/Lesson 12 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Ethical and Appropriate Use/Unit 3/Lesson 13 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Using Digital Tools Unit 3/Lesson 14 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

| **Wisconsin Reading Standards for Literacy in All Subjects\* (Language)**  **Grades 11-12**  \*Please see standards at <https://dpi.wi.gov/sites/default/files/imce/standards/pdf/las-stds.pdf> for detailed description and explanation. | Demonstrate command of English grammar when speaking and writing | Demonstrate command of capitalization, punctuation, and spelling when writing | Use language & its conventions when writing, speaking, reading and listening | Determine/clarify meaning of unknown and multiple- meaning words based on grades 11-12 reading content | Demonstrate understanding of figurative language, word relationships and nuances | Acquire and accurately use general academic and domain-specific words at the college and career ready levels. |
| --- | --- | --- | --- | --- | --- | --- |
| Lesson: | L - 1 | L - 2 | L -3 | L -4 | L -5 | L -6 |
| Getting Acquainted Unit 1/Lesson 1 |  |  |  |  |  |  |
| Teacher Expectations Unit 1/Lesson 2 |  |  |  |  |  |  |
| Lab Layout & Resources Unit 1/Lesson 3 |  |  |  |  |  |  |
| Learner Expectations Unit 1/Lesson 4 |  |  |  |  |  |  |
| Pre Assessment Unit 1/Lesson 5 |  |  |  |  |  |  |
| Problem Solving Pentagon Unit 2/Lesson 6 |  |  |  |  |  |  |
| Identifying Relevant Issues Friends & Family Unit 2/Lesson 7 |  |  |  |  |  |  |
| Identifying Relevant Issues Community Unit 2/Lesson 8 |  |  |  |  |  |  |
| Categorizing and Narrowing Options Unit 2/Lesson 9 |  |  |  |  |  |  |
| Decision Matrix Unit 2/Lesson 10 |  |  |  |  |  |  |
| Problem Selection & Team Context Unit 2/Lesson 11 |  |  |  |  |  |  |
| Selecting Digital Tools Unit 3/Lesson 12 |  |  |  |  |  |  |
| Ethical and Appropriate Use/ Unit 3/Lesson 13 |  |  |  |  |  |  |
| Using Digital Tools Unit 3/Lesson 14 |  |  |  |  |  |  |

| **Wisconsin Standards for Information and Technology Literacy\***  **(Empowered Learner)**  **(Digital Citizen)**  **(Knowledge Constructor)**  **Grades 9-12**  \*Please see standards at <https://dpi.wi.gov/sites/default/files/imce/imt/pdf/itlstandardsfinaladopted.pdf> for detailed description and explanation. | Set goals and reflect using digital tools | Build network to support learning and connect with experts and peers to enhance learning | Create personalized learning environment in ways that maximize the learning process | Seek and utilize feedback using digital and non-digital tools. Analyze data to make adjustments and justify outcomes | Understand and apply functions and operations. Choose, and troubleshoot current digital tools. | Transfer knowledge to emerging technology. Investigate the creation of new technologies. |  | Cultivate and manage digital identity and reputation | Manage personal data to maintain digital privacy and security. | Use information, media and digital resources in a responsible manner. | Respect intellectual property rights. Respond appropriately to gain permission for copyrighted material. Understand consequences of plagiarism. | Recognize rights and responsibilities of intellectual freedom. Ensure others have equitable access to media/technology |  | Plan and employ effective research strategies | Evaluate accuracy, perspective, credibility, relevance of information, media, data and the like | Locate and curate resources from various sources and organize into collections for varying projects & purposes | Produce creative artifacts for multiple audiences. Demonstrate meaningful connections or conclusions. Consider ow crowdsourcing impacts online and offline. | Build knowledge through active exploration of real-life issues/problems. Use digital resources and tools to engage others. |
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| Lesson: | ITL –EL1.a | ITL –EL1.b | ITL –EL1.c | ITL –EL1.d | ITL –EL2.a | ITL –EL3.a |  | ITL –DC1.a | ITL –DC1.b | ITL –DC2.a | ITL –DC2.b | ITL –DC2.c |  | ITL –KC1.a | ITL –KC1.b | ITL –KC1.c | ITL –KC2.a | ITL –KC2.b |
| Getting Acquainted Unit 1/Lesson 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Teacher Expectations  Unit 1/Lesson 2 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Lab Layout & Resources Unit 1/Lesson 3 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Learner Expectations  Unit 1/Lesson 4 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Pre Assessment Unit 1/Lesson 5 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Problem Solving Pentagon  Unit 2/Lesson 6 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Identifying Relevant Issues  Friends & Family  Unit 2/Lesson 7 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Identifying Relevant Issues Community  Unit 2/Lesson 8 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Categorizing and Narrowing Options  Unit 2/Lesson 9 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Decision Matrix Unit 2/Lesson 10 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Problem Selection & Team Context  Unit 2/Lesson 11 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Selecting Digital Tools  Unit 3/Lesson 12 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Ethical and Appropriate Use  Unit 3/Lesson 13 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Using Digital Tools  Unit 3/Lesson 14 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

| **Wisconsin Standards for Information and Technology Literacy\***  **(Innovative Designer)**  **(Computational Thinker)**  **Grades 9-12**  \*Please see standards at <https://dpi.wi.gov/sites/default/files/imce/imt/pdf/itlstandardsfinaladopted.pdf> for detailed description and explanation.. | Find authentic problems in local and global contexts | Exhibit tolerance for ambiguity, perseverance and capacity to work with authentic, open-ended problems. | Know and use a deliberate design process for generating ideas, testing theories, and creating innovative artifacts and solutions. | Select and use digital resources to plan and manage a design process that considers design constraints and calculated risks. | Develop, test, and refine prototypes as part of a cyclical design process. |  | Create and articulate a precise and thorough description of a problem designed to utilize digital tools, data analysis, abstract modeling or algorithmic thinking to facilitate a solution. | Select an effective digital tool to collect data, design, code, test, and verify possible solutions to reflect on the data to solve authentic problems. | Evaluate the problem solving process and algorithms of others, and synthesize this information to create the most effective and efficient way to solve an authentic problem. |
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| Lesson: | ITL –ID1.a | ITL –ID1.b | ITL –ID2.a | ITL –ID2.b | ITL –ID2.c |  | ITL –CT1.a | ITL –CT1.b | ITL –CT1.c |
| Getting Acquainted Unit 1/Lesson 1 |  |  |  |  |  |  |  |  |  |
| Teacher Expectations Unit 1/Lesson 2 |  |  |  |  |  |  |  |  |  |
| Lab Layout & Resources Unit 1/Lesson 3 |  |  |  |  |  |  |  |  |  |
| Learner Expectations Unit 1/Lesson 4 |  |  |  |  |  |  |  |  |  |
| Pre Assessment Unit 1/Lesson 5 |  |  |  |  |  |  |  |  |  |
| Problem Solving Pentagon Unit 2/Lesson 6 |  |  |  |  |  |  |  |  |  |
| Identifying Relevant Issues Friends & Family  Unit 2/Lesson 7 |  |  |  |  |  |  |  |  |  |
| Identifying Relevant Issues Community  Unit 2/Lesson 8 |  |  |  |  |  |  |  |  |  |
| Categorizing and Narrowing Options  Unit 2/Lesson 9 |  |  |  |  |  |  |  |  |  |
| Decision Matrix Unit 2/Lesson 10 |  |  |  |  |  |  |  |  |  |
| Selecting Digital Tools Unit 3/Lesson 12 |  |  |  |  |  |  |  |  |  |
| Ethical and Appropriate Use Unit 3/Lesson 13 |  |  |  |  |  |  |  |  |  |
| Using Digital Tools Unit 3/Lesson 14 |  |  |  |  |  |  |  |  |  |

| **Wisconsin Standards for Information and Technology Literacy\***  **(Creative Communicator)**  **(Global Collaborator)**  **Grades 9-12**  \*Please see standards at <https://dpi.wi.gov/sites/default/files/imce/imt/pdf/itlstandardsfinaladopted.pdf> for detailed description and explanation.. | Evaluate and determine appropriate platforms and digital tools to create, communicate, and share content effectively with an authentic audience. | Create works for an authentic audience that reflects responsible remixing of digital and Fair Use content. | Utilize digital tools to analyze, modify, and communicate complex ideas, data, and solutions to an authentic audience | Intentionally align message with audience, purpose, and task when publishing and presenting content. |  | Use digital tools to connect with learners from a variety of backgrounds and cultures, engaging with them in ways that broaden mutual understanding and learning. | Contribute constructively to project teams, assuming various roles and responsibilities to work effectively toward a common goal. | Select and leverage appropriate digital tools to contribute to and collect information from the exchange of ideas within and beyond the learning community. | Leverage collaborative digital tools to work with others – including peers, experts, and community members – to learn about issues and problems and to solicit diverse local and global perspectives to discuss solutions for social change. | Explore and analyze local and global issues and leverage collaborative digital tools to work with others to investigate, develop, and actualize solutions |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Lesson: | ITL –CC1.a | ITL –CC1.b | ITL –CC1.c | ITL –CC2.a |  | ITL –GC1.a | ITL –GC1.b | ITL –GC1.c | ITL –GC2.a | ITL –GC2.b |
| Getting Acquainted Unit 1/Lesson 1 |  |  |  |  |  |  |  |  |  |  |
| Teacher Expectations Unit 1/Lesson 2 |  |  |  |  |  |  |  |  |  |  |
| Lab Layout & Resources Unit 1/Lesson 3 |  |  |  |  |  |  |  |  |  |  |
| Learner Expectations Unit 1/Lesson 4 |  |  |  |  |  |  |  |  |  |  |
| Pre Assessment Unit 1/Lesson 5 |  |  |  |  |  |  |  |  |  |  |
| Problem Solving Pentagon Unit 2/Lesson 6 |  |  |  |  |  |  |  |  |  |  |
| Identifying Relevant Issues Friends & Family  Unit 2/Lesson 7 |  |  |  |  |  |  |  |  |  |  |
| Identifying Relevant Issues Community  Unit 2/Lesson 8 |  |  |  |  |  |  |  |  |  |  |
| Categorizing and Narrowing Options  Unit 2/Lesson 9 |  |  |  |  |  |  |  |  |  |  |
| Decision Matrix Unit 2/Lesson 10 |  |  |  |  |  |  |  |  |  |  |
| Problem Selection & Team Context  Unit 2/Lesson 11 |  |  |  |  |  |  |  |  |  |  |
| Selecting Digital Tools  Unit 3/Lesson 12 |  |  |  |  |  |  |  |  |  |  |
| Ethical and Appropriate Use  Unit 3/Lesson 13 |  |  |  |  |  |  |  |  |  |  |
| Using Digital Tools  Unit 3/Lesson 14 |  |  |  |  |  |  |  |  |  |  |

| **Wisconsin Common Career and Technical Core Standards\***  **(Creativity, Critical Thinking, Communication & Collaboration)**  **(Career Development)**  **Grades 9-12**  \*Please see standards at [https://dpi.wi.gov /sites/default/files/imce/cte /pdf/WCCTS\_Standards.pdf](https://dpi.wi.gov/sites/default/files/imce/cte/pdf/WCCTS_Standards.pdf) for detailed description and explanation. | Develop original solutions, products and services to meet a given need. | Work creatively with others to develop solutions, products and services. | Develop effective resolutions for a given problem, decision or opportunity using available information. | Develop and implement a resolution for a new situation using personal knowledge and experience. | Communicate thoughts and feelings with others using verbal /non-verbal language. | Work collaboratively with others | Use interpersonal skills to resolve conflicts with others in an ethical manner. |  | Identify personal strengths, aptitudes and passions. | Demonstrate effective decision-making, problem solving and goal setting. | Interact effectively with others in similar and diverse teams. | Apply a range of relevant decision-making strategies. | Apply academic experiences to the world of work, inter-relationships and the community. | Assess attitudes and skills that contribute to successful learning in school and across the life span. | Investigate the world of work in order to gain knowledge of self in order to make informed career decisions. | Examine and evaluate opportunities that could enhance life and career plans and articulate plan to guide decisions and actions. | Employ career management strategies to achieve future career success and satisfaction. |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| WCCTS – 4c1.a | WCCTS – 4c1.b | WCCTS – 4c2.a | WCCTS – 4c2.b | WCCTS – 4c3.a | WCCTS – 4c3.b | WCCTS – 4c3.c |  | WCCTS -CD1.a | WCCTS -CD1.b | WCCTS -CD1.c | WCCTS -CD1.d | WCCTS -CD2.a | WCCTS -CD2.b | WCCTS -CD3.a | WCCTS -CD3.b | WCCTS -CD3.c |
| Lesson: |
| Getting Acquainted Unit 1/Lesson 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Teacher Expectations  Unit 1/Lesson 2 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Lab Layout & Resources Unit 1/Lesson 3 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Learner Expectations  Unit 1/Lesson 4 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Pre Assessment Unit 1/Lesson 5 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Problem Solving Pentagon  Unit 2/Lesson 6 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Identifying Relevant Issues  Friends & Family  Unit 2/Lesson 7 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Identifying Relevant Issues Community  Unit 2/Lesson 8 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Categorizing and Narrowing Options  Unit 2/Lesson 9 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Decision Matrix Unit 2/Lesson 10 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Problem Selection & Team Context  Unit 2/Lesson 11 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Selecting Digital Tools  Unit 3/Lesson 12 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Ethical and Appropriate Use  Unit 3/Lesson 13 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Using Digital Tools Unit 3/Lesson 14 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

| **Wisconsin Common Career and Technical Core Standards\***  **(Career Development)**  **(Environment, Health & Safety)**  **(Global & Cultural Awareness)**  **Grades 9-12**  \*Please see standards at [https://dpi.wi.gov/sites/default /files/imce/cte/pdf/WCCTS\_Standards.pdf](https://dpi.wi.gov/sites/default/files/imce/cte/pdf/WCCTS_Standards.pdf) for detailed description and explanation. | Identify and demonstrate positive work behaviors and personal qualities needed to be employable | Demonstrate skills related to seeking and applying for employment to find and obtain a desired job. | Identify and exhibit traits for retaining employment. | Develop positive relationships with others. |  | Assess the interdependency among natural and human-built systems, including social, ecological and economic health. | Engage in systems thinking and inquiry processes that identify problems while analyzing the impacts of decisions made now and in the future. | Develop solutions to social, economic and ecological problems without compromising the ability of future generations to meet their needs. | Implement personal and jobsite safety rules and regulations to maintain and improve safe and healthful working conditions and environments. |  | Evaluate the effects of diversity encountered through interactions with people in or from other parts of the community, state, nation and world. | Explain how events in one part of the world affect nations, communities and individuals in other parts of the world. | Explain how diverse groups of people can work together to overcome local, national, regional and global crises. | Work effectively with diverse individuals in a variety of settings and contexts. | Develop innovative solutions and initiatives as part of a diverse team. |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| WCCTS -CD4.a | WCCTS -CD4.b | WCCTS -CD4.c | WCCTS -CD4.d |  | WCCTS -EHS1.a | WCCTS -EHS1.b | WCCTS -EHS1.c | WCCTS EHS1.d |  | WCCTS -GCA1.a | WCCTS - CA1.b | WCCTS -GCA1.c | WCCTS -GCA2.a | WCCTS - CA2.b |
| Lesson: |
| Getting Acquainted Unit 1/Lesson 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Teacher Expectations Unit 1/Lesson 2 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Lab Layout & Resources  Unit 1/Lesson 3 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Learner Expectations Unit 1/Lesson 4 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Pre Assessment Unit 1/Lesson 5 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Problem Solving Pentagon  Unit 2/Lesson 6 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Identifying Relevant Issues  Friends & Family  Unit 2/Lesson 7 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Identifying Relevant Issues Community  Unit 2/Lesson 8 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Categorizing and Narrowing Options  Unit 2/Lesson 9 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Decision Matrix Unit 2/Lesson 10 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Problem Selection & Team Context  Unit 2/Lesson 11 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Selecting Digital Tools  Unit 3/Lesson 12 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Ethical and Appropriate Use  Unit 3/Lesson 13 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Using Digital Tools Unit 3/Lesson 14 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

| **Wisconsin Common Career and Technical Core Standards\***  **(Information, Media & Technology)**  **(Leadership)**  **Grades 9-12**  \*Please see standards at [https://dpi.wi.gov/sites/default /files/imce/cte/pdf/WCCTS\_Standards.pdf](https://dpi.wi.gov/sites/default/files/imce/cte/pdf/WCCTS_Standards.pdf) for detailed description and explanation. | Choose appropriate sources of data and information for a given purpose. | Determine the relevance, validity and timeliness of data and information. | Select relevant information necessary for making decisions and solving problems. | Apply data and information to communicate ideas and create new opportunities. | Analyze media messages to determine biases and objectivity. | Prepare media products in order to communicate a specific message. | Adopt new technological tools to increase personal and organizational productivity. | Select and use communication and information technology to help solve problems and provide opportunities. |  | Implement leadership skills to accomplish team goals and objectives. | Employ teamwork skills to achieve collective goals and use team members/talents effectively. | Identify the role of community service and service learning in family, community and business and industry. |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| WCCTS -IMT1.a | WCCTS -IMT1.b | WCCTS -IMT1.c | WCCTS -IMT1.d | WCCTS -IMT2.a | WCCTS -IMT2.b | WCCTS -IMT3.a | WCCTS -IMT3.b |  | WCCTS -LE1.a | WCCTS -LE1.b | WCCTS -LE1.c |
| Lesson: |
| Getting Acquainted Unit 1/Lesson 1 |  |  |  |  |  |  |  |  |  |  |  |  |
| Teacher Expectations Unit 1/Lesson 2 |  |  |  |  |  |  |  |  |  |  |  |  |
| Lab Layout & Resources Unit 1/Lesson 3 |  |  |  |  |  |  |  |  |  |  |  |  |
| Learner Expectations Unit 1/Lesson 4 |  |  |  |  |  |  |  |  |  |  |  |  |
| Pre Assessment Unit 1/Lesson 5 |  |  |  |  |  |  |  |  |  |  |  |  |
| Problem Solving Pentagon Unit 2/Lesson 6 |  |  |  |  |  |  |  |  |  |  |  |  |
| Identifying Relevant Issues Friends & Family  Unit 2/Lesson 7 |  |  |  |  |  |  |  |  |  |  |  |  |
| Identifying Relevant Issues Community  Unit 2/Lesson 8 |  |  |  |  |  |  |  |  |  |  |  | ` |
| Categorizing and Narrowing Options  Unit 2/Lesson 9 |  |  |  |  |  |  |  |  |  |  |  |  |
| Decision Matrix Unit 2/Lesson 10 |  |  |  |  |  |  |  |  |  |  |  |  |
| Problem Selection & Team Context  Unit 2/Lesson 11 |  |  |  |  |  |  |  |  |  |  |  |  |
| Selecting Digital Tools  Unit 3/Lesson 12 |  |  |  |  |  |  |  |  |  |  |  |  |
| Ethical and Appropriate Use  Unit 3/Lesson 13 |  |  |  |  |  |  |  |  |  |  |  |  |
| Using Digital Tools Unit 3/Lesson 14 |  |  |  |  |  |  |  |  |  |  |  |  |

**UNIT 1**

**INTRODUCTIONS & EXPECTATIONS**

|  |
| --- |
| **GETTING ACQUAINTED** |
| **Lesson Plan #1** |
| **Unit 1:** Introduction & Expectations |

|  |  |
| --- | --- |
| **Grade Level:** 10 -12 | **Instructor:** Sylvia Tiala |
| **Time Allotted:** 1- 50 minute period | **Address:** [tialasyl@gmail.com](mailto:tialasyl@gmail.com)  N4551 446th Street, Menomonie, WI |
| **School District/Organization:**  **C:\Users\Sylvia\Pictures\Sylvia Fold Logo.jpg** | **Date:** June 25, 2018 |
| **Adaptations & Acknowledgments:**  This lesson was adapted from Aerospace as well as Engineering & Virtual Problem Solving courses previously taught at Boone High School in Boone, Iowa. | |
| [Creative Commons License](http://creativecommons.org/licenses/by-nc/4.0/)**Creative Commons License Attribution:**  Problem Solving Curriculum Guide: A Process - Based Approach for Secondary Schools by Sylvia Tiala is licensed under a [Creative Commons Attribution-NonCommercial 4.0 International License](http://creativecommons.org/licenses/by-nc/4.0/) | |

**Brief Description:**

First day activities have students introducing themselves to their peers, and begin establishing a collaborative classroom geared toward problem solving.

**Standards**:

*Wisconsin Standards for Literacy in All Subjects:*

* SL-1 Participate in collaborative discussions
* SL-6 Adapt speech
* L-1 Demonstrate command of English Language
* L-6 Acquire domain specific words

*Wisconsin Standards for Information and Technology Literacy:*

* Not applicable

*Wisconsin Common Career and Technical Core Standards*

* WCCTS-CD1a Identify personal strengths and passion
* WCCTS-CD4d Develop positive relationships

**Students’ Essential Question(s):**

* What are some strategies for communicating effectively?

**Learner’s “I Can Statements”**

* I can tell you what I enjoy doing/am passionate about
* I can tell you what my strengths are
* I can introduce myself with confidence

**Assessment/Assessment Criteria**

*Formative:*

Teachers’ observation of students’ participation/contribution to discussion

Teacher’s observation of students’ confidence during self-introduction.

*Summative:*

Not applicable – first day of course

**Materials Needed:**

“Getting to Know You” card

“Groups versus Teams” worksheet

Pencils/pens for each student

Digital Projector

Access to computer with link to Internet and/or presentations downloaded (How to Introduce yourself - <https://www.youtube.com/watch?v=bYgrzeFu7LI>).

**Vocabulary**

*Executive presence* – project an impression of being mature and self-confident, able to work with other strong-willed and talented people, and take control of unpredictable situations (Beeson, 2012).

*Group* – a group of people who coordinate individual efforts (Sisson, 2013).

*Team* – people who share a common purpose, common goals, and share a mutual commitment to one another and the team goals (Sisson, 2013).

**What do I know about my students that will inform this lesson?**

Learners will have a variety of backgrounds and a variety of experiences. Some learners will struggle with open-ended problems solving and self-directed learning. Students may need basic instruction in communicating face-to-face/one-on-one with others particularly when meeting people for the first time, cold calling on the telephone, or sending appropriately formatted emails as they build a professional network.

**How does this lesson connect with and build on previous lesson(s)?**

Not applicable. This is the first lesson of the course. However, the course should help bring together life and educational experiences of each learner.

**How will I (the teacher) build upon this lesson in subsequent lessons?**

This lesson introduces learners to the course expectations. Introductions of students to peers and instructor help build individual comfort levels for future lessons. This lesson is designed to set a tone of respect and active learning.

**Lesson Implementation**

|  |  |  |
| --- | --- | --- |
| ***Instructor Will*** | ***Time allotted*** | ***Student Will*** |
| *Prepare for class*  Arrange seats in the classroom in a U shape or circle to encourage talking and collaboration.  Post course number/name, course instructor and welcome message on board  Review list of resources for background information and supporting ideas/evidence for lesson.  Preview video: Sicola, L. (2016, April 27). How to introduce yourself like a leader [Video file]. Retrieved from <https://www.youtube.com/watch?v=bYgrzeFu7LI> . Be prepared to connect the video with your lesson.  Review differences between groups and teams. An example can be found at: Surbhi, S. (2015, March 24). *Difference between group and team.*  Retrieved from <https://keydifferences.com/difference-between-group-and-team.html>.  Prepare seating chart and name tags for students’ assigned seats [https: //www.superteachertools.us/](https://www.superteachertools.us/)). Place name tags at appropriate places in the classroom  Post/write vocabulary words and definitions on board  Post the I can statements on the board  Post/write list of activities on board  Place pads of sticky notes/1/4 sheets of paper on the tables where students will have access to them. | 45 minutes are needed to copy items, write introductory messages on boards, connect to the internet for video, organize materials, and the like | Not applicable – preparation for teacher |
| *Anticipatory set*  Greet students at the door  Hand them a “Getting to Know You Card” and ask them to find their assigned desk and begin to fill out their card. | 5 minutes as students change/enter the classroom | Students will find their seats and begin to complete their “Getting to Know You” card |
| *Introduce Activities*  Good Morning/Afternoon (as appropriate).  My name is XXXX and I want to welcome you to XXXXXX (identify course name).  If you haven’t had a chance to complete your “Getting to Know” card please do your best in the next XX seconds/minutes (provide wait time as appropriate). Please turn your cards over when you have finished.  Today we will be completing 4 tasks: (point to board/reference sheet where items are posted)   1. We will introduce ourselves to one another 2. We will look at key terms for the day 3. We will review the syllabus 4. We will review my expectations for the course   Are there any questions? | 3 minutes | Pause a moment after good morning/afternoon so students will respond. If no response repeat the greeting until students respond with a “good morning/good afternoon” response.  Students complete the “Getting to Know You” card  Students listen as you continue  Students should ask questions. Answer questions that arise. |
| *Content*  During this class we will be working with one another to solve problems. Sometimes we will be working as a group and sometimes we will be working as a team. What is the difference between groups and teams? I want all of us to consider and discuss what the difference might be. Take this 1 minutes and brainstorm as many ideas as you can: What are the similarities between teams and groups?  Take another minute and continue to brainstorm: What are the differences between teams and groups?  How do you see yourself contributing to a team? Take 2 minutes to brainstorm your ideas. We will then share our ideas.  As we move through the semester please keep in mind that I will be asking all of us to work collaboratively and help one another as we identify and solve problems around us.  ---------------------------  In order to work collaboratively and in order to make a good impression with others we need to be able to speak effectively to each other. We will start practicing this skill today by introducing ourselves like leaders. Let’s start by getting some tips from Laura Sicola, a leadership communications coach in Philadelphia. In her talks she speaks about “Executive presence”. This refers to the way a person demonstrates confidence and an ability to be a strong leader that can work with others in unpredictable situations (refer to definition on board).  Show h*ow to introduce yourself like a leader* ([https://www.youtube.com/watch?v=b YgrzeFu7LI](https://www.youtube.com/watch?v=bYgrzeFu7LI)). | 6 minutes  5 minutes  4 minutes | Students will brainstorm ideas for 2 minutes.  Ask students to share their ideas.  Take 2 minutes to get some ideas.  Use the remaining 2 minutes to discuss the definition and talk about the difference between teams and groups. See if students’ responses compared with the posted definition posted on the board.  Ask students to brainstorm the answer this question for 2 minutes.  Use the remaining 3 minutes to discuss with students the ways they might contribute to a team/group  Learners will watch TED video on speaking with “executive presence” |
| *Student Practice*  I handed you a card as you walked into the room today. I asked you to write down your name, one thing you were passionate about, and your strengths. Let’s practice the tips that Laura Sicola provided by using our tone of voice to say our name with confidence and tell one another what we are passionate about and what our strengths are. We have about 1 minute each. I will start:  Indicate what you are passionate about  Indicate what your strengths are  Ask for a volunteer to start or pick a student to start the introductions.  Note: Collect students’ cards and file them for your reference and later use | 25 minutes (about 1 minute each)  Leave enough time to complete the lesson plan | Students will say their name (with confidence) and indicate what they are passionate about and what their strengths are.  Be prepared for reluctant students. If they can’t find any passions or strengths have them share hobbies/interests, etc.  Let students pass and come back to them to allow them to think if needed.  Encourage all to speak |
| *Clean Up*  Let’s take 1 minute to stack your papers neatly at your desk. Please leave your pencils for the next group (or indicate students can take pencils). Provide directions for handing in their “Personal Passion and Strength” card from the opening activity. Provide other directions per your situation. | 1 minute | Students clean up their desk/table area. |
| *Closure*  Will someone please volunteer to summarize the major ideas we addressed today? Have students reflect on the lesson: teamwork and introductions. Thank you! You did a fantastic (or other positive) job reflecting on your passions, your strengths and introducing yourselves to one another. | 1 minute | As student(s) to summarize what topics ideas were addressed.  Be prepared to call on students  Reinforce student participation |
| *Reflection:\**  Tomorrow when you come to class I would like you to return to your assigned seats. Today, I will ask that you please stay in your seats until the bell rings. While you are waiting I would like you to think about 2 questions:   1. What takeaways from today’s lesson will be important to you three years from now? 2. Why?   Depending on time you can add discussion. Alternative ideas can be found at websites such as: <https://www.edutopia.org/blog/22-powerful-closure-activities-todd-finley>  \* Review and summarize students’ feedback and respond with a tweet, a post to a learning information system or a comment at the beginning of the next class to indicate you have read and value learners’ reflections. Consider a positive note to students and/or parents making sure that each student in the class gets positive feedback in an equitable fashion throughout the semester. | 1 minute | Students can do the reflection informally. Time permitting and with willing students you can ask for feedback from the students. |

**Teacher’s Comments/Self-Assessment:** (use this space to reflect on what you would do differently, how the lesson unfolded, notes about students, and the like).

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teaching.com/userfiles/kcfinder/files/Successful\_Teaching\_Newspaper\_515.pdf](https://www.effectiveteaching.com/userfiles/kcfinder/files/Successful_Teaching_Newspaper_515.pdf)

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**Lesson 1 Resources**

**Getting to Know You**

Name

Grade Hour:

I enjoy/am passionate about:

My strengths are:

\_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_\_ \_ \_ \_ \_ \_ \_ \_ \_ \_ Cut Line \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_

**Getting to Know You**

Name:

Grade: Hour:

I enjoy/am passionate about:

My strengths are:

**Groups versus Teams**

What is the difference between groups and teams? Pair up with another person in the class. Take 1 minute to brainstorm how teams and groups are similar. Take 1 minute to brainstorm how teams and groups are different. Be prepared to share your ideas with the class.

|  |  |
| --- | --- |
| Similar | Different |
|  |  |

Ways I can best contribute will be to:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  | | --- | | **TEACHER’S EXPECTATION** | | **Lesson Plan #2** | | **Unit 1:** Introduction and Expectations |  |  |  | | --- | --- | | **Grade Level:** 10 -12 | **Instructor:** Sylvia Tiala | | **Time Allotted:** 1- 50 minute period | **Address:** [tialasyl@gmail.com](mailto:tialasyl@gmail.com)  N4551 446th Street, Menomonie, WI | | **School District/Organization:**  **C:\Users\Sylvia\Pictures\Sylvia Fold Logo.jpg** | **Date:** June 25, 2018 | | **Adaptations & Acknowledgments:**  This lesson was adapted from Aerospace as well as Engineering & Virtual Problem Solving courses previously taught at Boone High School in Boone, Iowa. | | | [Creative Commons License](http://creativecommons.org/licenses/by-nc/4.0/)**Creative Commons License Attribution:**  Problem Solving Curriculum Guide: A Process - Based Approach for Secondary Schools by Sylvia Tiala is licensed under a [Creative Commons Attribution-NonCommercial 4.0 International License](http://creativecommons.org/licenses/by-nc/4.0/) | |   **Brief Description:**  Day two activities orient students to the course instructor’s expectations. It establishes rules and procedures that are expected of all students.  **Standards**:  *Wisconsin Standards for Literacy in All Subjects:*   * RH-2 Determine central ideas * RH-4 Determine meaning * L-6 Acquire domain specific words * SL-1 Participate in collaborative discussions * SL-3 Evaluate a speaker’s point of view and reasoning   *Wisconsin Standards for Information and Technology Literacy:*   * ITL-GC1.c Leverage digital tools to contribute to information   *Wisconsin Common Career and Technical Core Standards*   * WCCTS-CD4a Identify positive work behaviors needed to be employed   **Students’ Essential Question(s):**   * What qualities make a person responsible?   **Learner’s “I Can Statements”**   * I can tell you what the expectations are for this teacher’s classroom * I can tell you what activities we will be doing this semester * I can tell you how I will be graded in this class during this semester * I can use a digital tool (Kahoot or other) to participate in a discussion   **Assessment/Assessment Criteria**  *Formative:*  Muddiest point card (<http://www.cdio.org/files/mudcards.pdf>)  Students will be able to work respectfully (your expectations identified) in the classroom  *Information Technology Survey –* not graded - teacher observation and peer utilization  *Learning Growth Survey* – not graded - teacher observation and peer utilization  *Appropriate Educational Risk Survey* *–* not graded - teacher observation and peer utilization  *Summative:*  Students will be able to respectfully and responsibly participate in the course  **Materials Needed:**  “What do you need from me” feedback form  “Muddiest point” handout form (end of lesson feedback)  Course syllabus – student version  Expectations/Rules/Regulations to convey course management and safety protocols. It should be noted that the items included in this document are examples only. You should develop resources for your comprehensive classroom management and safety plan that fall within the guidelines of your school district, state and nation. Consult local, state and federal laws and policies as you develop and implement your safety program in your classroom/school/district. Examples included here are:   * RESPECT/Classroom rules sheet – or other acronym as per teacher preference * Classroom Expectations * Safety Contract Example * 100 Word Safety Essay Example   Kahoot (teacher/creator = <https://kahoot.com/>; student/player: <https://kahoot.it/>) with questions from course syllabus or use Jeopardy at SuperTeacherTools as an alternative (<https://www.superteachertools.us/>).  *Information Technology –* one copy per student  *Learning Growth Survey* –one copy per student  *Appropriate Educational Risk Survey* *–* one copy per student  Digital Projector  Internet access  **Vocabulary**  *Syllabus –* a document that communicates course requirements and expectations  **What do I know about my students that will inform this lesson?**  Students will be listening to rules and regulations in a number of courses and from a number of teachers. It is important to try and present the information that you want students to get in a way that will engage them.  **How does this lesson connect with and build on previous lesson(s)?**  This lesson is intended to convey the expectation of a respectful classroom. Lesson 1 recognized learners as individuals. This lesson establishes the idea that all individuals in the classroom will be treated respectfully. The “What do you need from me” is intended to provide feedback from your students regarding their perceived needs and to help establish a relationship with the learners. Lesson 2 lays the groundwork for the next lesson that provides an overview to the lab layout and general procedures used in the lab environment. Both lesson 2 and 3 tie to instructor expectations and classroom management.  **How will I (the teacher) build upon this lesson in subsequent lessons?**  This lesson introduces learners to the course expectations. This lesson is designed to set a tone of respect and interest in students as individuals. The information that is collected with be helpful as the teacher mentors students through the problem solving process.  **Lesson Implementation**   |  |  |  | | --- | --- | --- | | ***Instructor Will*** | ***Time allotted*** | ***Student Will*** | | *Prepare for class*  Arrange seats in the classroom in a U shape, circle or around tables to encourage talking and collaboration.  Review list of resources for background information and supporting ideas/evidence for lesson the first days of school.  Copy “What Do You Need From Me” handout. Provide a copy for each student at their desk.  Copy the “Muddiest Point” handout  Generate a course syllabus, list of expectations, safety rules, safety contracts and the like to convey your classroom expectations and safety procedures to students, parents, and administrators. Post/copies of the appropriate documents in course management systems as applicable. Provide a copy for each student (neatly organized) on individual desks).  Examples of the following documents are posted for perusal.   * Syllabus * RESPECT classroom expectations * Classroom Expectation list * Safety Contract Example * 100 Word Safety Essay Example   Post/write vocabulary word and definitions on board  Post the “I can” statements on the board  Prepare Kahoot (<https://kahoot.com/>) for class discussion or a Jeopardy game at SuperTeacherTools (<https://www.superteachertools.us/>) or similar.  Post/write list of activities on board  Copy the *Learning Growth Survey*, the *Appropriate Educational Risk Survey* and the *Information Technology* survey found under Lesson Plan 3 Resources to hand out for homework assignment. | 45 minutes are needed to copy items, post items to Kahoot or similar, organize materials, and the like assuming revisions and updates to the syllabus and supporting documents are in place | Not applicable – preparation for teacher | | *Anticipatory set*  Good morning/afternoon everyone. I would like to start the day by getting you’re an important question. What do you need from me to help you be successful in this class? Please take 3 minutes and write down how I might best help you this semester. We will not be sharing these but I will be collecting your feedback. | 3 minutes  1 minute to collect feedback | Students use the “What do you need from me” sheets to write down their feedback. | | *Introduce Activities*  Over the next 4 days we are going to work together to establish some guidelines for our class and lab. Today we are going to review the syllabus. Who knows what a syllabus is?  --Refer to posted vocabulary item (syllabus) and address the meaning.  We will look at my expectations and the course syllabus today. Tomorrow we will familiarize ourselves with our lab space. On the following day I am going to ask you to tell me how you want to demonstrate your own growth and academic risk taking in this course. You will be determining how a portion of your grade is determined.  Does anyone have any questions? | 3 minutes | Students should be listening  Answer questions as they arise. | | Content (NOTE: These are example activities. You will need to generate your own examples as per your teaching style, school rules, and local procedures and policies)  There are several items in front of you. We will get to the syllabus in a few moments. The next item is a RESPECT sheet. RESPECT is an acronym that for the type of classroom I expect to see.  Go through the RESPECT sheet and indicate how you see this being a part of your classroom.  You may consider having students read the items aloud and then have a person in the class provide an example  Refer students to safety contracts, safety violation sheets, general safety policies and the like that you are implementing in your class. Discuss course fees, when and how they are due, safety glasses policies. If students need to purchase supplies or materials this should be indicated as well. Safety contracts, parental permission slips, and the like should be disseminated so students have some time to obtain signatures from parents/guardians. You are answering the question, “What supplies and fees are associated with the course? What are the instructors’ expectations? What do I need to do to get started in the class?”  The final item in front of you is the course syllabus. Working in pairs please take 10 minutes to review the syllabus. | 7 minutes  7 minutes  10 minutes | Students will read an item in turn an provide an example.  Discuss and clarify as the students have questions.  Students will take necessary forms home for parental signatures, sign forms and return to the instructors, and other action as policy/procedure dictates.  Students will review the syllabus for 10 minutes | | Student Practice  Review syllabus  Play Kahoot (or similar)  Log onto Kahoot and create you syllabus quiz teacher generates questions at: <https://kahoot.com/>; student/player: <https://kahoot.it/> | 14 minutes | Students log onto Kahoot and play the syllabus quiz. | | Clean Up  Have students put papers, pencils, materials away | 1 minute | Students tidy up work area | | Closure  Today we took a look at my expectations of respectful behavior and assignments for the semester. Tomorrow you will get a brief overview of the classroom and lab. You will get an idea of the tools and materials you will have to work with. On the following day I am going to ask you to tell me about your expectations in the course. How do you want to demonstrate your ability to use informational technology? Your learning growth? Your willingness to take educational risks? I am going to ask you to complete 3 short surveys to help get you start thinking about these three items. Please complete them and return them tomorrow. This will give all us time to prepare and use the feedback for our future discussions. .  Hand out the *Learning Growth Survey*, the *Appropriate Educational Risk Survey* and the *Information Technology* *Survey* | 2 minute |  | | Reflection\*  Please take the last two minutes of class to complete the Muddiest Point card. Leave your cards (indicate where) at the end of the class.  \* Review and summarize students’ feedback and respond with a tweet, a post to a learning information system or a comment at the beginning of the next class to indicate you have read and value learners’ reflections. Consider a positive note to students and/or parents making sure that each student in the class gets positive feedback in an equitable fashion throughout the semester. | 2 minutes | Students should fill out muddiest point card and leave them in a designated spot as the leave the classroom |   **Teacher’s Comments/Self-Assessment:** |

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**Lesson 2 Resources**

**What do you need from me?**

Please use the next 3 minutes to reflect what you need from me, as the course instructor, to help you be successful in this class this semester.

\_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_\_ \_ \_ \_ \_ \_ \_ \_ \_ \_ Cut Line \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_

**What do you need from me?**

Please use the next 3 minutes to reflect what you need from me, as the course instructor, to help you be successful in this class this semester.

Insert Your Picture Here

Example Student Syllabus

Please Customize!!

Welcome to: Name of Class

I am Your Name:

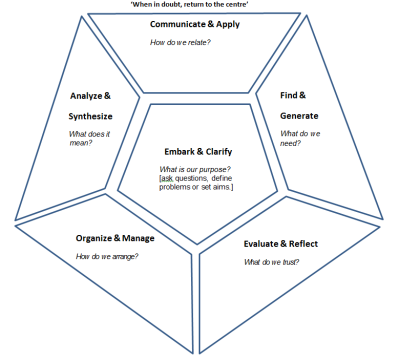
You can get in touch with me at:

Email

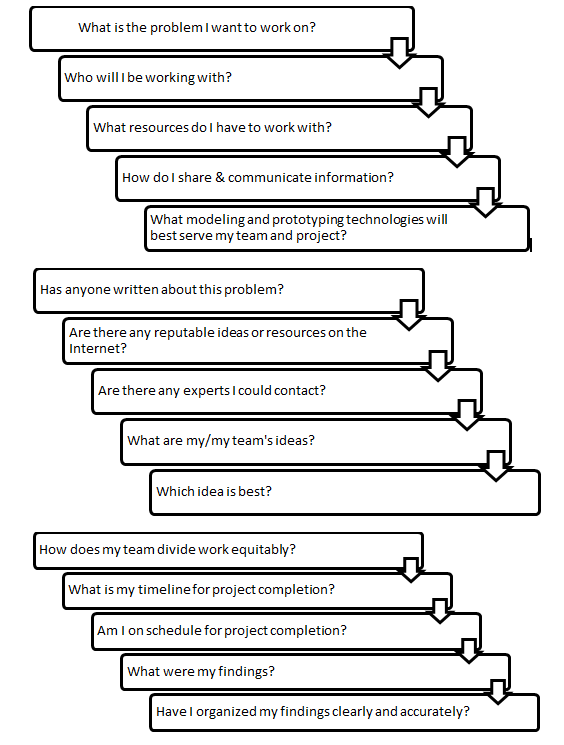
Telephone number

We meet in room:

**What is this course about?**

 You will be using a non-linear problem solving process that uses 6 facets of problem solving as shown below

Questions You Will Be Answering

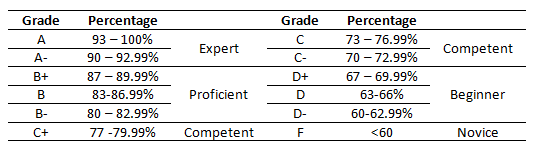


**One word to describe my expectations:**

RESPECT

Major Assignments

|  |
| --- |
| Student Individual Performance  40% - Teacher Generated |
| Group Evaluation  10% - Teacher Generated |
| Denson, Buelin, Lammi & D’Amico Assessment  10% Independent Review – Final |
| Other Miscellaneous  10% - Teacher Generated |
| Learning Growth  10% - Student Generated |
| Appropriate Educational Risk  10% - Student Generated |
| Information/Digital Literacy  10% |



**Course Name**

**Course Number**

**Syllabus**

**Course Policies**

* List policies here or on back
* Depending on room and length

Insert required policy statements:

Please let me know about your individual needs (hearing loss, sight loss, reading difficulties, heavy workloads, after school sports, family obligations, medical conditions, etc.) during the FIRST WEEK OF CLASS. This will help me create the best possible learning environment for you as an individual.

**Modify and insert additional information such as the name of units, a weekly calendar or other information as per instructor, course, school, district policy.**

**Tools you will be using**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | The laser engraver is used to cut a variety of materials not limited to fabric, leather, wood, cardboard and more. The laser engraver will engrave (or raster) or cut through (vector) materials. |  |  | The three-dimensional printer will take files you draw on a computer and print three-dimensional scale models. |
|  | The vinyl cutter has a small knife that will cut through vinyl and copper foils. You can use this machine to cut stencils for signs, decals, T-shirt/fabric stencils and more. | | |  |
|  | The large computer-numerical-controlled milling machine will handle wood material up to 4’ x 8’ and cuts soutlines and recesses in wood, Styrofoam and softer materials. |  |  | Roland’ mini mill is used to mill soft materials such as wax and Styrofoam for smaller molds. It is also used to mill circuit boards is used to make electronic parts. |

**Your Name’s Classroom Expectations – Example**

This is one example of a single resources for your consideration as you develop your classroom management and safety plan. Safety plans and classroom management plans should fall within the guidelines of your school district, state and nation. Consult local, state and federal laws and policies as you develop and implement your safety program in your classroom/school/district

|  |  |
| --- | --- |
| **R** | **R**espect yourself, your peers and the classroom. Use appropriate and professional language. Remember the *Golden Rule: Do unto others . . .* |
| **E** | **E**ngage yourself in the class. Answer questions. Prepared participation in class activities is expected. |
| **S** | **S**tudents will not disrupt the learning of others |
| **P** | **P**hones and electronic devices --- INSERT YOUR PHONE POLICY HERE IF USING THIS ITEM |
| **E** | **E**mploy effective communication strategies as you interact with your peers, community professionals, personal acquaintances and reach out to others within and external to the school district. |
| **C** | **C**ourtesy toward others is expected at all times. “If you don’t have anything nice to say, don’t say it at all.” |
| **T** | **T**ools and materials should be properly cared for. Do not intentionally damage tools, materials and/or classroom contents. Report broken tools, spills, and the like to the course instructor |

I understand and agree to abide by the classroom rules set by (Insert Teacher’s Name Here)

Student Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(Printed/Signed)

I have read (Your Name)’s classroom rules. I understand that my son/daughter/ward \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (student name) needs to abide by these classroom rules.

Parent/Guardian \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(Printed/Signature)

**PROCESS-BASED PROBLEM SOLVING CLASSROOM EXPECTATIONS – EXAMPLE**

This is one example of a single resource for your consideration as you develop your classroom management and safety plan. Safety plans and classroom management plans should fall within the guidelines of your school district, state and nation. Consult local, state and federal laws and policies as you develop and implement your safety program in your classroom/school/district

# INSTRUCTOR: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ROOM: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**COURSE: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ LAB FEES:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**DUE: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**CLASSROOM EXPECTATIONS:**

1. Students will not disrupt the learning of others.
2. Students are expected to behave in a respectful manner. These expectations are covered in *Code(s) List your school district’s code here.*

Violation to this code:

1st time = Warning+

2nd time = Call Home

3rd time = Out of class until appropriate action with principal, parent, counselor, teacher, & student to discuss further participation.

1. Students will behave in a manner that promotes a safe work environment for all students.

Violation to this code:

1st time = Warning+

2nd time = Detention\* and 100 word safety report that is mailed home.

3rd time = Out of class until appropriate action with principal, parent, counselor, teacher, & student to discuss further participation.

1. Students will inform the teacher/ask permission to leave the classroom. Time of leaving and returning will be recorded on your time cards and participation points will be taken away.
2. Students will bring the required materials to class and have them every day. Failure to do so will result in reduction of points.

+ Instructors may opt to jump to a level 2 or 3 in extreme cases

\* Detentions will be arranged for *Insert your/District’s Policy*

I understand the above policies, the results of not following them, and agree to abide by all of

them.

Student's Signature \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**I understand the importance of a respectful and safe environment and understand the teacher’s expectations in this \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (course name) course.**

Signature of Parent/Guardian\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**SAFETY CONTRACT - EXAMPLE**

**Available at the Northeast Wisconsin Fab CoP**

(<https://www.curriki.org/groups/northeast-wisconsin-fab-lab/>)

**Document link:** <https://www.curriki.org/oer/example-of-aSafety-letter>

This is one example of a single resource for your consideration as you develop your classroom management and safety plan. Safety plans and classroom management plans should fall within the guidelines of your school district, state and nation. Consult local, state and federal laws and policies as you develop and implement your safety program in your classroom/school/district

**DUE** Back the first week of Semester!

**XXX TECHNOLOGY EDUCATION DEPARTMENT**

**STUDENT CLASSROOM & LAB SAFETY PLEDGE CONTRACT**

Student's Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Period (hr) \_\_\_\_\_\_\_Semester\_\_\_\_\_\_\_\_\_\_

(Student's Name) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_- is enrolled in (class) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

As part of the program experience, he/she will operate machines and tools, providing that the parent(s) or guardian gives written permission.

It is understood that each student will be given proper instruction, both in the use of the equipment and in the correct safety procedures concerning it, before being allowed to operate the piece of equipment. The student must assume responsibility for following safe practices, and we therefore ask that the following lab/classroom safety pledge be signed.

1. I understand that safety is the number one priority in the lab and the classroom.

2. I will abide by school policies as stated in the student handbook.

3. I will wear safety glasses at all times while in lab regardless of what I am doing.

4. (Students are required by both school policy and by state/federal law to wear safety glasses)

5. I will never use a machine or tool without having permission from the instructor, having passed the safety test and been given a demonstration for the machine.

6. I will report any accident or injury to the instructor immediately.

7. I understand that any type of horseplay, dangerous behavior of any type-whether it's towards a student, instructor or yourself, and other forms of inappropriate behavior are not permitted in the lab or classroom,

8. Any of these actions will result in immediate removal from the class and may result with a failing grade.

9. I understand that profanity is not acceptable at any time.

10. I will maintain proper care and usage of equipment at all times

11. I understand that Zero-Tolerance is the policy of the Technology Department concerning all of these policies

I understand the above policies, the results of not following them, and agree to abide by all of them.

Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Student's Signature \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**I hereby give my consent to allow my son/daughter to operate all machines, tools and**

**equipment necessary in carrying out the requirements of the above course.**

Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Signature of Parent/Guardian\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

★ If you would like to be invited into our google classroom (if available) as a

parent/guardian please Enter your email below.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Please understand that your son/daughter will not be allowed to do any lab work until this form is completely signed and returned.

Any questions or concerns please contact the NAME Department at

Area Code- Phone Number.ext ???

(Teacher’s Name).

**100 WORD SAFETY ESSAY EXAMPLE:**

This is one example of a single resource for your consideration as you develop your classroom management and safety plan. Safety plans and classroom management plans should fall within the guidelines of your school district, state and nation. Consult local, state and federal laws and policies as you develop and implement your safety program in your classroom/school/district

**Please attach this cover sheet with your essay.**

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

As a result of repeated safety violations in an Industrial Technology class you are required to write a 100 word essay. This essay is given to you for the following reasons:

1. It allows you to reflect on your dangerous behavior in the classroom.
2. It allows you to demonstrate to the supervisor/teacher that you understand possible ramifications/consequences of your unsafe behavior. In other words, how do your actions affect you, other students, visitors and teachers in the lab?
3. It documents both your efforts and the teacher’s efforts to maintain a safe working environment.
4. It allows you to explain how you can/will correct future behavior in the classroom.

Your essay should therefore contain the following sections:

* 1. What were the safety violation(s) that led up to this essay.
     1. When and how were the original rules regarding safety given to you.
     2. What were the events that led to your safety violation?
     3. What were the dates of these events?
  2. How might the actions you are demonstrating affect safety for:
     1. Yourself
     2. Your peers
     3. Others in the classroom/building
     4. Teacher
  3. What will you do to correct your behavior in the future?

Teacher Call Log – Example

Don’t forget the sunshine calls!!

*Note: This is AN EXAMPLE OF ONE item to consider as part of a larger class/lab management safety plan that you develop in your district. Please consult local, state, and national policies as you devise your own class/lab management policies.*

Teacher: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |  |  |
| --- | --- | --- | --- |
| Contacted: | Telephone/email | Date: | Results/ Comments: |
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**Example Kahoot Syllabus Questions to Help Get Started:**

(Modify to fit your own syllabus, revisions, and expectations)

1. What is the main focus of this class?
   1. Making things
   2. Problems solving (correct answer)
   3. Socializing with friends
   4. Working with tools and machines
2. What is the best time to talk to your teacher about make up work?
   1. Before school
   2. After school
   3. Before class
   4. During class
3. The model we will use to solve problems throughout the semester is known as
   1. Engineering process model
   2. Design process model
   3. Problem solving pentagon model (correct answer)
   4. Scientific method model
4. The acronym for the type of behavior expected in this course is:
   1. DO IT!
   2. COLLABORATE
   3. RESPECT
   4. SAFEWORK
5. The best way to help your teacher help you is:
   1. Wait until you are in crisis
   2. Keep quiet
   3. Talk to your teacher
   4. Disrupt others
6. Late work will be accepted
   1. Any time during the semester
   2. Within one week
   3. Late work is not accepted
   4. Your policy here

**Information Technology Survey**

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

It is difficult for any one person to keep up with new technologies and applications. This survey is intended to inventory the skills of the whole class so that we can best share our expertise.

Please answer the following questions to help your peers understand your technology access, use and expertise.

Do you have Internet at home (check one) O Yes O No

How easy is your home internet to use ?

Enter a number between 1 and 10

(fast and easy = 10, very slow dial up = 1)

Please list the types of digital tools you use to interact with friends and family. Be specific - Phone type, specific phone apps, social media, computer programs.

I use:

Please indicate the types of program and applications you use for your school work and learning. Be sure you list items you use in school as well as learning related to hobbies and personal interests. Word, Google docs, Snapchat, Khan Academy, Pinterest, etc. Be as comprehensive as possible.

I use:

**Optional assessment to include (modify as needed/remove if not being used)**

|  |  |  |
| --- | --- | --- |
| **Not Proficient** | **On the Path** | **Proficient** |
|  | | |
| No survey  No time/effort given | Survey late  Some time/effort evident | Survey reflects effort  Time and effort is evident |

**Appropriate Educational Risk Taking Survey**

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Appropriate educational risk taking is trying something new like exploring a new way to learn something, participating more often or in a different way to achieve your learning goals. This type of risk taking may be out of your comfort zone but is seen as a good thing. Examples might include trying a new presentation app for an upcoming presentation, contributing to a conversation when you are generally quiet, or using a phone app to prevent texting while driving. This is NOT intended to describe negative behaviors like cheating. Use the space below to describe examples of appropriate educational risks that you have taken.

**Optional assessment to include (modify as needed/remove if not being used)**

|  |  |  |
| --- | --- | --- |
| **Not Proficient** | **On the Path** | **Proficient** |
|  | | |
| No survey  No time/effort given | Survey late  Some time/effort evident | Survey reflects effort  Time and effort is evident |

**Learning Growth Survey**

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Learning growth occurs when you learn new skills, change your attitudes, or change the way you behave over time. Learning how to ride a bike is an example of showing growth in learning. Learning how to spell, then write words and finally writing sentences is another example of learning growth. There may be times when you learned a lot but had little to show for it. One example I can think of was baking a cake from scratch then dropping it on the floor as I went to frost it. I learned how to bake the cake but it ended up in pieces in the garbage can. Another time I wrote a long essay – right before the computer crashed – honestly!!

Please take time to reflect on those times when you have learned something new. Think about how you would demonstrate to another person that you had grown in your understanding, attitudes, or skills. How could you prove that you had learned something?

**Optional assessment to include (modify as needed/remove if not being used)**

|  |  |  |
| --- | --- | --- |
| **Not Proficient** | **On the Path** | **Proficient** |
|  | | |
| No survey  No time/effort given | Survey late  Some time/effort evident | Survey reflects effort  Time and effort is evident |

Muddiest Point Card

Please use the next 3 minutes to reflect on today’s lesson and write down the point you found the muddiest and that you would like clarified

\_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_\_ \_ \_ \_ \_ \_ \_ \_ \_ \_ Cut Line \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_

Muddiest Point Card

Please use the next 3 minutes to reflect on today’s lesson and write down the point you found the muddiest and that you would like clarified

**Additional Classroom Management/Safety Resources:**

The following pages contain an incomplete sample of resources for your consideration in your classroom management and safety plan. Safety plans and classroom management plans should fall within the guidelines of your school district, state and nation. Consider discussing your safety plan with your school administrators. Please note that that you should not assume that all necessary safety procedures and protocols are contained in this document or within these examples and references. Consult local , state and federal laws and policies as you develop and implement your safety program.

**An excellent source to consider is:**

Roy, K. R., & Love, T. S. (2017). *Safer makerspaces, fab labs and STEM labs: A collaborative guide!* Vernon, CT: National Safety Consultants LLC. ISBN-13:978-0-692-92408-2

**Examples to consider – not a comprehensive list**

Bergeson, T., Heuschel, M. Lahmann, M. Fieldman, R. Broom, M. Opp, M, Stanford, R. & Olsen, J. (2002, September). *Safety guide for career and technical education.* Retrieved from <https://www.cdc.gov/niosh/docs/2004-101/pdfs/safe.pdf>

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  | | --- | | **LAB LAYOUT & RESOURCES** | | **Lesson Plan # 3** | | **Unit 1:** Introduction and Expectations |  |  |  | | --- | --- | | **Grade Level:** 10 -12 | **Instructor:** Sylvia Tiala | | **Time Allotted:** 1- 50 minute period | **Address:** [tialasyl@gmail.com](mailto:tialasyl@gmail.com)  N4551 446th Street, Menomonie, WI | | **School District/Organization:**  **C:\Users\Sylvia\Pictures\Sylvia Fold Logo.jpg** | **Date:** June 25, 2018 | | **Adaptations & Acknowledgments:**  This lesson was adapted from Aerospace as well as Engineering & Virtual Problem Solving courses previously taught at Boone High School in Boone, Iowa. | | | [Creative Commons License](http://creativecommons.org/licenses/by-nc/4.0/)**Creative Commons License Attribution:**  Problem Solving Curriculum Guide: A Process - Based Approach for Secondary Schools by Sylvia Tiala is licensed under a [Creative Commons Attribution-NonCommercial 4.0 International License](http://creativecommons.org/licenses/by-nc/4.0/) | |   **Brief Description:**  Lesson 3 introduces students to the layout of the lab, general lab safety rules and areas for work storage, tool access, and the overall aspects of navigating the classroom/lab space.  **Standards**:  *Wisconsin Standards for Literacy in All Subjects:*   * L-3 Use language and its conventions   *Wisconsin Standards for Information and Technology Literacy:*  *Wisconsin Common Career and Technical Core Standards*   * WCCTS-4c3a Communicate thoughts using verbal/non-verbal language   **Students’ Essential Question(s):**   * What qualities make a person responsible?   **Learner’s “I Can Statements”**   * I can tell you what the general safety rules are for this teacher’s classroom * I can navigate the room and find the necessary resources in the classroom   **Assessment/Assessment Criteria**  *Formative:*  “Orientation to Lab Space Activity” or teacher’s alternative  End of class reflections  *Information Technology Survey –* graded as appropriate for your setting  *Learning Growth Survey –*graded as appropriate for your setting  *Appropriate Educational Risk Survey* - graded as appropriate for your setting  *Summative:*  Students will be able to safely participate in the course  **Materials Needed:**  Lab Overview Power Point or equivalent  Digital Projector  General Lab Safety and Housekeeping Rules  Optional: Consider creating and disseminating a General Lab Safety and Housekeeping Rules quiz as part of a larger safety/classroom management plan  Orientation to Lab Space handout  Lab/classroom floor plan for your particular lab/classroom space  Notecards/1/2 sheet of paper for final reflection activity  Students need to return their *Information Technology Survey, Learning Growth Survey,* and *Appropriate Educational Risk Survey* for you to look through. Review and aggregate the findings. This will give you a starting point for what/how students are thinking. It will help you guide and steer student learning during lesson 4. Be prepared to hand the surveys back to their owners during the second day of lesson 4 activities.  **Vocabulary**  Vector graphics – uses math equations to select points that are connected by lines and curves. The paths can be scaled without losing quality. Typical computer file formats are .svg, .cgm, .odg, .eps, and .xml. (<https://vectr.com/tutorials/what-are-vector-graphics/>)  Raster graphics – use small squares called pixels to create an image. When an image is enlarged it loses quality as the pixels increase in size. Common file formats for raster graphics are .tiff, .bmp, .gif, .jpeg and .png. (<https://vectr.com/tutorials/what-are-vector-graphics/>).  Material Safety Data Sheet - MSDS are sheets of information that list potential hazards, storage requirements, and safe use of materials and products (<https://en.wikipedia.org/wiki/Safety_data_sheet>).  **What do I know about my students that will inform this lesson?**  Students may have no experience with tools and machines. The names of the machines, their purpose, and what they do may be unfamiliar. Implement the lesson in a way that both the “expert’ and “novice” can successfully complete the assigned lab activity.  **How does this lesson connect with and build on previous lesson(s)?**  The lesson builds on the previous day by introducing general safety rules and expectations for safe behavior in the lab.    **How will I (the teacher) build upon this lesson in subsequent lessons?**  This lesson addresses the basic layout of the class/lab space, storage and tool areas, and general safety rules. It lays the groundwork for students’ familiarity with the lab. Future lessons will assume students are able to access the tools, materials, and storage areas they need to work safely in the lab.  **Lesson Implementation**   |  |  |  | | --- | --- | --- | | ***Instructor Will*** | ***Time allotted*** | ***Student Will*** | | *Prepare for class*  Arrange seats in the classroom in a U shape or circle to encourage talking and collaboration.  Review list of resources for background information and supporting ideas/evidence for lesson.  Create a lab tour Power Point, or similar specific to your own lab and classroom.  Prepare your version of *General Lab Safety and Housekeeping Rules* and make 2 copies (1 for students’ files, one for your files – consider making a poster and posting the rules).  Please Note: The *General Lab Safety and Housekeeping Rules* handout is one example of a single resource for your consideration as you develop your classroom management and safety plan. Safety plans and classroom management plans should fall within the guidelines of your school district, state and nation. Consult local, state and federal laws and policies as you develop and implement your safety program in your classroom/school/district  Copy *Orientation to Your Lab Space* activity for each student. Please Note: The *Orientation to Your Lab Space* handout is one example of a single resource for your consideration as you develop your classroom management and safety plan. Safety plans and classroom management plans should fall within the guidelines of your school district, state and nation. Consult local, state and federal laws and policies as you develop and implement your safety program in your classroom/school/district  Post the “I can” statements on the board  Post vocabulary words and definitions on the board  Post/write list of activities on board  Determine protocols for collecting the *Learning Growth Survey*, the *Appropriate Educational Risk Survey* and the *Information Technology* | 45 minutes are needed to copy items, post items and arrange the classroom space.  Extra time will be needed to generate photos, presentation, and safety rule sheets for this activity. | Not applicable – preparation for teacher | | *Housekeeping*  Good morning/afternoon everyone. Please turn in your three surveys from yesterday. You can turn them in – indicate your procedures.  *Anticipatory set*  Today we are going to look at our classroom and lab. Who in here can tell me what one machine in the lab is and what it is used for (wait for answers)?  Spend two minutes interacting with students and getting them to identify tools in the lab.  Note: this activity will serve as an informal assessment of what students know/don’ know about the equipment in the room. Discussion/instruction can vary according to learners’ responses. | 1 minute  3 minute discussion | Students will turn in their *Appropriate Education Risk Taking, Learning Growth* and *Information Technology* surveys.  Students will be looking at the lab area and determining what equipment they can identify and what they are familiar with.  Students will discuss what tools they are familiar with | | *Housekeeping*  Good morning/afternoon everyone. I would like you to please turn in your homework from yesterday. These are the three surveys you should have completed (provide appropriate directions)  *Introduce Activities*  We will start today by reviewing general safety rules that will be in place for all lab activities.  Following this we will take a look at some major equipment in the lab followed by a lab familiarization activity. | 2 minutes  1 minute | Students turn in work  Students listen | | *Content*  (NOTE: These are example activities. You will need to generate your own examples as per your teaching style, your comprehensive safety plan, your specific classroom and lab layout, school rules, and local procedures and policies)  Hand out your version of the *General Lab Safety and Housekeeping Rule* as per your safety procedures and protocols. In this example you might assign students to one of seven groups. SuperTeacherTools (<https://www.superteachertools.us/>) can be used tor randomly assign students to groups. Assign each group to a section(s) of your version of the *General Lab Safety and Housekeeping Rules* to review and summarize. Give each group 2 minutes to read their section and 2 minutes to come up with a summary. Have a spokesperson from each group sum up the major points of their section for others in the class. Consider developing a written safety test to administer as part of a comprehensive safety plan. Indicate due date and procedures for returning your version of the *General Lab Safety and Housekeeping Rules* document.  (Tie this part of the lesson back to the discussion in the “Anticipatory Set” section of the lesson). Some of you in here may be very familiar with the machines and equipment in here. Others of you may not be familiar with the equipment. I want to take a few minutes to give you a brief overview the major pieces of equipment (and whatever else you will include in your presentation) you will use during the semester. Please raise your hand if you have questions. We will be using the information from this presentation in our next activity.  Call up and present your visual “Lab Tour presentation” and present to the class. | 10 minutes  2 minutes  5 minutes | Students will read, summarize and report on the general safety rules required in the course.  Students will sign your version of the *General Lab Safety and Housekeeping Rules* documents you develop for this activity and return as per your directions.  Students will listen/watch the presentation and ask questions | | *Student Practice*  Hand out your version of the *Orientation to Your Lab Space* worksheet and lab floor plan.  Briefly describe the activity and have students look for the items on the list and draw them in the floor plan. As students return their floor plans check to make sure that they are able to find all of the listed items. Ask if they had trouble finding any of the items on the list. Be sure they know where exits, fire extinguishers, eye wash stations, and the like are located. | 20 minutes | Students complete the lab space activity or other as assigned by instructor. | | *Clean Up*  Have students turn in assigned activities from the day such signed safety sheets and lab orientation activities. Provide directions on how they should be submitted. | 1 minute | Students tidy up work area – keeping pencil ready for final reflection | | *Closure*  Over the past two day we have discussed my expectations for all of you. Today we looked at general safety guidelines as well as the layout of the lab and your working space. Over the next two days I will be asking you for your feedback. How do you want to demonstrate your own learning growth? How will you demonstrate your ability to take appropriate educational risks? How will you demonstrate your use of information technologies? The surveys that you completed for today: the *Learning Growth Survey*, the *Appropriate Educational Risk Survey* and the *Information Technology* will help us with this discussion.  Collect the *Learning Growth Survey*, the *Appropriate Educational Risk Survey* and the *Information Technology* survey assignment if students hadn’t finished them by the beginning of the hour.  *Note:* Use today and the next day to review students’ answers from their returned surveys. This will help inform activities during lesson 4. Be prepared to hand surveys back to their owner on day 2 of lesson 4 activities. These surveys may or may not be “officially graded” but consider providing informal feedback to students letting them know that their efforts were above proficient, proficient, or below proficient and what they needed to do to improve. A rubric or uniform feedback mechanism should be utilized. Do not mark directly on student surveys as they will be handed back during lesson 4 activities. | 2 minutes | Students listen | | *Reflection*  Imagine that one of your friends missed class today. Please take 2 minutes and summarize what today’s lesson was about in two to four sentences. Leave your responses (direct students where to leave responses)  \* Review and summarize students’ feedback and respond with a tweet, a post to a learning information system or a comment at the beginning of the next class to indicate you have read and value learners’ reflections. Consider a positive note to students and/or parents making sure that each student in the class gets positive feedback in an equitable fashion throughout the semester. | 2 minutes | Students should complete the assigned assessments and submit them by the deadlines |   **Teacher’s Comments/Self-Assessment:** |

**References:**

The following pages contain an incomplete sample of resources for your consideration in your classroom management and safety plan. Safety plans and classroom management plans should fall within the guidelines of your school district, state and nation. Consider discussing your safety plan with your school administrators. Please note that that you should not assume that all necessary safety procedures and protocols are contained in this document or with these examples and references. Consult local , state and federal laws and policies as you develop and implement your safety program.

**Sources to consider are:**

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**Lesson 3 Resources**

**General Lab Safety and Housekeeping Rules - Example**

This is one example of a single resource for your consideration as you develop your classroom management and safety plan. Safety plans and classroom management plans should fall within the guidelines of your school district, state and nation. Consult local, state and federal laws and policies as you develop and implement your safety program in your classroom/school/district

**General Rules of Safety**

General safety

1. No work may be performed using power tools unless at least two people are in the lab and they can see each other.

2. Be sure you have sufficient light to see clearly when doing any job.

3. Be sure to know the location of fire extinguishers and emergency exits.

4. Get help in lifting or moving any bulky or heavy tool, attachment, equipment or material.

5. Report any unsafe acts, conditions, broken tools/equipment to the lab supervisor immediately.

Equipment use

1. Do not operate any item of equipment unless you are familiar with its operation and have been authorized to operate it.

2. If in doubt . . . ASK!

3. Use the equipment for its intended purpose.

4. Check power cords and plugs on portable tools for damage before using them

5. Always see that work and cutting tools on any machine are clamped securely before starting.

6. Machines must be operated with all guards and shield in place.

7. Do not leave a machine while it is running. Someone else may not notice it is still running, and be injured.

8. Do not try to stop the machine with your hands or body.

9. Never use a rag near moving machinery

Materials

1. Ask lab personnel before cutting any unusual material.

2. Check the hazardous materials data sheet for specific precautions needed when using new material.

3. Follow all appropriate precautions when working with solvents, paints, adhesives or other chemicals

4. Consult materials safety data sheet (M. S. D. S) for specific precautions to be taken while working with material you are unfamiliar with.

5. Perform heavy sanding and painting in a well-ventilated area.

Concentrate

1. Concentrate on the work and the machine at all times, it only takes a moment for an accident to occur.

2. No horseplay/running is allowed in the lab.

3. Do not work in the shop if you are tired, upset, drugged, under the influence of alcohol or in a hurry.

4. Do not talk to others while they are operating a machine.

Cleanup

1. Use brush, hook, or vacuum cleaner to remove chips from machines (never use bare hands).

2. Do not use compressed air guns to clean clothing, hair, or aim at another person.

**Rules Concerning Clothes and Safety Equipment**

1. Eye protection (safety glasses with safety shields, goggles, and face shields) must be worn at all times.

2. Shoes covering the whole foot (no sandals, flip flops) must be work in the lab.

3. Long hair must be tied back

4. Do not wear ties, loose clothing, hoodies with string ties, jewelry, gloves, etc. when operating lab equipment.

5. Wear short sleeves, or sleeves rolled above the elbow.

6. Wear appropriate clothing for the job (i.e. gloves for hot items, long shirt sleeves for welding, proper footwear.

7. Do not wear gloves near moving machinery

8. Use appropriate protective equipment (respirators for spray finishes/solvents/resins, welding goggles, hearing protection, etc.)

**Rules Concerning Housekeeping**

1. Practice cleanliness around the machines. Keep the floor around the machines clean, dry and free from trip hazards. Do not allow chips and waste pieces to accumulate.

2. Keep floors free of oil, grease or any other liquid. Clean up spilled liquids immediately; they are slipping hazards.

3. Return all excess material to its proper storage place.

4. Put tools away when not in use.

5. Place all scrap in scrap containers.

6. Always store oily rags in an approved metal container.

7. Flammable liquids such as gasoline, solvents, and thinners must be stored in approved safety cans and/or cabinets

**Rules Concerning Injury Reporting**

1. Report all accidents and injuries to the lab supervisor immediately no matter how slight.

2. Contact with harmful chemical should be reported immediately.

3. If chemicals get in eyes wash for 15 minutes in an open flow of water before proceeding for medical treatment.

4. Get first aid immediately for ANY injury.

5. The campus emergency phone number is 911 (9 – 911 may be used to reach city emergency).

6. Do not attempt to remove foreign objects from eye or body. Seek medical attention immediately at campus health services or 911/9-911.

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Printed Name Signature Date Signed**

**I have read and understand the above rules and agree to comply with them**

**LAB TOUR EXAMPLE VISUAL AND SCRIPT - EXAMPLE**

Note: You need to tailor an overview of the lab to your own lab setting, type of equipment, storage areas and the like. This is a starting point that is part of a larger lab orientation. Focus on providing a general overview of the lab.

|  |  |
| --- | --- |
| **Visual** | **Script** |
| Insert Welcome Image | Welcome to Name the School’s laboratory. Let’s take a few minutes to get a brief overview your lab. |
| Purpose:   * Solve local problems using local resources * Connect with mentors and experts in a larger/global community * Develop problem – solving skills * Utilize your creativity | Use this slide to orient students to the purpose of the course and lab. Be clear for yourself and your students about the lab’s purpose and the resulting expectations. |
|  | There are XX (indicate the number of major pieces of equipment you will be highlighting) machines that you will be working with this semester. Let’s take a brief look at them. |
|  | The Roland laser engraver is used to cut a variety of materials not limited to fabric, leather, wood, cardboard and more. The laser engraver will engrave (or raster) or cut through (vector) materials. Show examples of vector and raster cuts/engraving  *(Note: Provide examples of items made on the machine if possible. Pass the examples around the classroom. Other examples may be placed in/near the machine during introductory activities.)* |
|  | The vinyl cutter has a small knife that will cut through vinyl and copper foils. You can use this machine to cut stencils for signs, decals, T-shirt/fabric stencils and more.  *(Note: Provide examples of items made on the machine if possible. Pass the examples around the classroom. Other examples may be placed in/near the machine during introductory activities.)* |
|  | The three-dimensional printer will take files you draw on a computer and print three-dimensional scale models.  *(Note: Provide examples of items made on the machine if possible. Pass the examples around the classroom. Other examples may be placed in/near the machine during introductory activities.)* |
|  | The large computer-numerical-controlled milling machine will handle wood material up to 4’ x 8’ (or whatever specifications your mill has). Cutting bits (keep explanations simple for novice users at this point in the course) cut outlines and recesses in wood, Styrofoam and softer materials.  *(Note: Provide examples of items made on the machine if possible. Pass the examples around the classroom. Other examples may be placed in/near the machine during introductory activities.)* |
|  | Roland’ mini mill is used to mill soft materials such as wax and Styrofoam for smaller molds. It is also used to mill circuit boards that is used to make electronic parts.  *(Note: Provide examples of items made on the machine if possible. Pass the examples around the classroom. Other examples may be placed in/near the machine during introductory activities.)* |
|  | In addition to the small mill there is an electronics area in the lab. Electronic parts, soldering irons and test equipment is found in this area. It allows you to turn your milled circuit boards into working electronic devices.  *(Note: Provide examples of items made at the station if possible. Pass the examples around the classroom. Other examples may be placed in/near the machine during introductory activities.)* |
| **Insert photos of storage units and other items you want to highlight for your students.** | Speak to material storage, tools cabinets, or procedures to help your students navigate the lab.  (*Note: Consider assigning lockers/storage during the lab activity)* |

**Orientation to Your Lab Space - Example**

This is one example of a single resources for your consideration as you develop your classroom management and safety plan. Safety plans and classroom management plans should fall within the guidelines of your school district, state and nation. Consult local, state and federal laws and policies as you develop and implement your safety program in your classroom/school/district

*Note: You will need a map of your own lab space and to modify the following checklist before implementing this activity.*

Please take time to visit and explore your lab. Use the map on the following page to locate (sketch/draw/write) and label and identify the items listed below. When you are confident you have a familiarity with the lab, please sign this sheet. Make sure your name is on the completed map on the next page and submit both your completed map and this signed checklist to your course/lab instructor(s). Be prepared for a brief oral interview.

I am able to locate and identify the following items within the lab

|  |  |
| --- | --- |
| * 3 entrances * Classroom area * Project storage/locker * Master power switch * 2 fire extinguishers * Eye wash station * Sink for washing hands * Ear plugs * Ventilation switches * Air assist for laser * Laser engraver/cutter machine(s) | * Vinyl cutter * 3D Printers * Large CNC milling machine (Shopbot) * Small CNC milling machine(s) (Modella) * Scanning technologies * Electronic fabrication area * Design and Collaboration spaces * Vinyl Materials * Hand tool cabinet * Measuring tools |

I have found the items listed above and I am able to navigate the different areas of the fab lab. I am aware of where safety-related items such as power shut offs, ventilation switches, and fire extinguishers are located. I feel confident that I am able to function safely and competently in the lab.

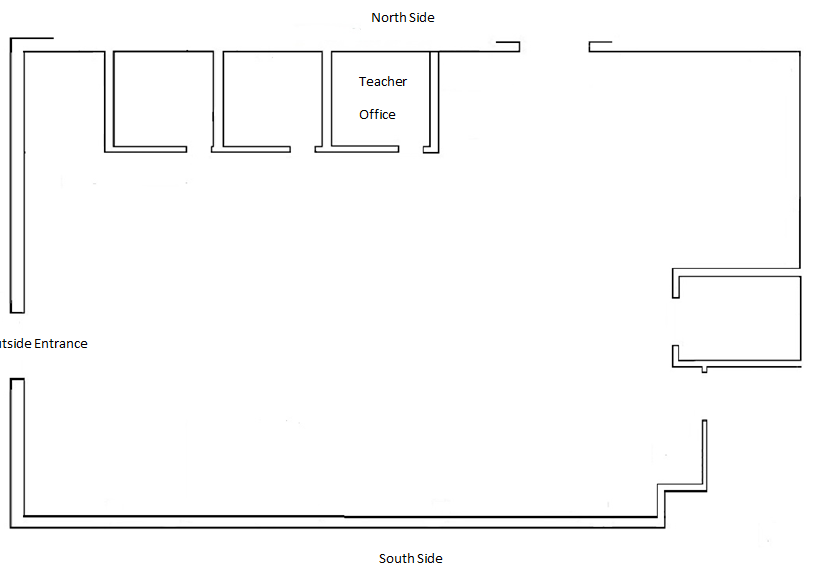
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Participant Name (print & sign legibly) Date

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Instructor/Lab Manager Date

NAME \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_



|  |
| --- |
| **LEARNER EXPECTATIONS** |
| **Lesson Plan #4** |
| **Unit 1:** Introduction and Expectations |

|  |  |
| --- | --- |
| **Grade Level:** 10 -12 | **Instructor:** Sylvia Tiala |
| **Time Allotted:** 2 - 50 minute period | **Address:** [tialasyl@gmail.com](mailto:tialasyl@gmail.com)  N4551 446th Street, Menomonie, WI |
| **School District/Organization:**  **C:\Users\Sylvia\Pictures\Sylvia Fold Logo.jpg** | **Date:** June 25, 2018 |
| **Adaptations & Acknowledgments:**  This lesson was adapted from Aerospace as well as Engineering & Virtual Problem Solving courses previously taught at Boone High School in Boone, Iowa. | |
| [Creative Commons License](http://creativecommons.org/licenses/by-nc/4.0/)**Creative Commons License Attribution:**  Problem Solving Curriculum Guide: A Process - Based Approach for Secondary Schools by Sylvia Tiala is licensed under a [Creative Commons Attribution-NonCommercial 4.0 International License](http://creativecommons.org/licenses/by-nc/4.0/) | |

**Brief Description:**

Lesson four activities set the stage for elements of a democratic classroom. Students should get the sense that they will become partners in the problem-solving and learning process. Students will continue to interact with peers that they were introduced to on Day 1 and 2 activities.

**Standards**:

*Wisconsin Standards for Literacy in All Subjects:*

* RH-2 Determine central ideas and provide accurate summaries
* RST-2 Determine central ideas
* RST-4 Determine meaning of terms in domain specific context
* SL – 1 Participate in collaborative discussions
* SL – 3 Evaluate speaker’s point of view and reasoning
* L-1 Demonstrate command of English grammar when speaking
* L-6 Acquire and use academic and domain-specific words

*Wisconsin Standards for Information and Technology Literacy:*

* ITL-EL1.c Create personalized learning environments to maximize learning
* ITL-GC1.b Contribute constructively to project teams

*Wisconsin Common Career and Technical Core Standards*

* WCCTS-4c2.b Develop a resolution for a new situation using personal experience
* WCCTS-4c3.b Work collaboratively with others
* WCCTS -CD2.b Assess attitudes and skills that contribute to successful learning
* WCCTS -CD4.a Identify positive work/personal behaviors need to be employable
* WCCTS-CD4.d Develop positive relationships with others
* WCCTS -IMT1.c Select relevant information

**Students’ Essential Question(s):**

* What role do I play in defining my own future?

**Learner’s “I Can Statements”**

* I can identify skills that help lead to successful learning
* I can identify several ways learning works best for me
* I can list digital tools that I can use to document my learning
* I can tell people how I would like to be assessed on my learning
* I can make positive contributions to a team
* I can select relevant information from a variety of sources

**Assessment/Assessment Criteria**

*Formative:*

Teacher observation as students generate assessment criteria for learning growth, appropriate educational risk and use of information technologies as per class assignments

Out the Door Activity cards from: <http://eduscapes.com/sessions/ems/stop.pdf>

*Summative:*

Student-generated assessments for learning growth, appropriate educational risk, and use of information technologies will be incorporated into class activities and assessed at the end of the semester.

**Materials Needed:**

Day 1:

Delzer, F. (2015) *Reimagining Classrooms: Leaders as st* TEDxFargo talk: <https://www.youtube.com/watch?v=w6vVXmwYvgs>

Delzer’s *Reimagining Classrooms* Viewing Guide handout

Strategies to show Learning Growth/Educational Risk Taking/Digital Literacy handout with links to resources – one per student

Out the Door Activity cards from: <http://eduscapes.com/sessions/ems/stop.pdf> and as listed at: <https://www.edutopia.org/blog/22-powerful-closure-activities-todd-finley>

Day 2:

Students’ completed *Learning Growth Survey, Appropriate Educational Risk Survey,* and *Information Technology Survey* that are collated for each student – returned to students during the second day of this lesson.

Use SuperTeacherTools “Group Maker” (or other) <https://www.superteachertools.us/> - to randomly assign students to groups of 3 – 5 individuals. You will be jigsawing a portion of the exercise so it will be helpful to have groups that are a multiple of 3 (3, 6, 9).

Sticky notes – 3” x 3” or ¼ sheets of paper & tape

Large poster paper for posting sticky notes – 3 sheets labeled respectively for each group: Learning Growth, Digital Literacy, Appropriate Educational Risk, and one blank sheet.

Large poster paper by exit for students to post their final reflection at the end of class on day 2.

Paper and Pencil for brainstorming

**Vocabulary**

*Digital Literacy –* find, evaluate, create and communicate information using digital platforms (Google docs, Twitter, Facebook, web pages, and the like).

*Gatekeeper* – a person who controls access (i.e. teachers determining what is learned, where it is learned and the methods used to learn)

*Grit-* sticking with a goal even when there are obstacles and/or when solutions take a long period of time to implement.

*Innovation*- a new idea, process, or device that did didn’t exist before or the improvement of existing ideas, processes, or devices.

*Problem Solving-* finding solutions to problems using a defined process or series of steps

**What do I know about my students that will inform this lesson?**

Learners will have a variety of backgrounds and a variety of experiences. Some learners will struggle with open-ended problems solving and self-directed learning. Students may need basic instruction in communicating face-to-face/one-on-one with others particularly when meeting people for the first time, cold calling on the telephone, or sending appropriately formatted emails as they build a professional network. Student will need to practice and be reassured that their serious efforts at addressing the lesson goals will be incorporated into the course.

**How does this lesson connect with and build on previous lesson(s)?**

Teacher rules have been defined. Students are expected to demonstrate appropriate educational risk taking, growth in learning, and digital literacy. This lesson ties in with setting the tone and expectations for the course that began with the teacher expectations.

**How will I (the teacher) build upon this lesson in subsequent lessons?**

Students build teamwork expertise. They begin to build the collaboration and problem solving skills and strategies that are needed for the course. Students begin to understand that they are active learners and will have input into how they are assessed throughout the course.

**Lesson Implementation**

|  |  |  |
| --- | --- | --- |
| ***Instructor Will*** | ***Time allotted*** | ***Student Will*** |
| *Prepare for class*  Review list of resources for background information and supporting ideas/evidence for a democratic classroom that informs this lesson..  Download and review Delzer’s TEDxFargo talk: <https://www.youtube.com/watch?v=w6vVXmwYvgs>  Watch Tom Wujec’s talk on solving wicked problems at: <https://www.ted.com/talks/tom_wujec_got_a_wicked_problem_first_tell_me_how_you_make_toast> . Reflect on his use of sticky notes to get feedback from all participants and establish common goals.  Review Krikst, T. (2015). Visible thinking: the sticky note [Blog post]. Retrieved from [http://weinquireandinspire.blogspot.com/2015/02/visible-thinking -sticky-note.html](http://weinquireandinspire.blogspot.com/2015/02/visible-thinking-sticky-note.html) for ideas on using sticky notes in the classroom  Arrange room in to encourage group/team interaction and discussion.  Post the I can statements on the board  Post/write list of activities on board  Post on board:  Main ideas from Delzer talk:  Release the Power  Embrace Purposeful Technology  Access to Social Media (don’t feed the fear)  Make Global Connections  Assessing Skills of Today  Day 2:  Post/write vocabulary word and definitions on board  Sticky notes or ¼ sheets of paper and tape for brainstorming  3 large poster size paper for students to use for posting smaller sticky notes  Collated *Appropriate Education Risk, Learning Growth,* and *Information Technology* surveys ready to be returned to each student | 90 minutes are needed to prepare for this lesson including watching videos and reviewing suggested web sites and reviewing student responses from the 3 assigned surveys: *Learning Growth Survey*, the *Appropriate Educational Risk Survey* and the *Information Technology* survey | Not applicable – preparation for teacher |
| *Day 1 Anticipatory set*  Who in here has ever been bored with school? Why? Get a couple of examples from students.  My goal in this class is to make your learning as relevant and interesting as I know how to do. But I need your help. I need you to be partners with me in the learning process as we continue in this course. I will be asking you to come up with ways to asses yourself on educational risk taking, use of information technology to demonstrate digital literacy, and growth in learning. Your strategies will be incorporated into the course and account for 30% (or you determine) of your grade. So let’s be strategic on how we think about, talk about and generate your criteria. | 3 minutes  1 minute | Students will raise hands  Students will share several examples (take up to 3 minutes to do this) |
| *Day 1 Content*  ((Hand out *Delzer’s Reimaging Classrooms Viewing Guide*)  A woman named Kayla Delzer has captured the essence of what I want this course to look like. She asks her learners to be active participants in their own learning. I am going to ask the same of you. As you watch the video, pay attention to her main points and think about how her ideas might connect to your learning in this course. Specifically:   * How might (I) your teacher “Release the Power”? * What kinds of technology might we use to “Embrace Purposeful Technology”? * What technology resources/social media can we use in this class to access the tools that you need to be successful (don’t feed the fear)? * How would you demonstrate that you could connect to others on a global level? * How would you like to be assessed on grit, digital literacy, citizenship and innovation (the skills of today)?   Use the viewing guide handout to record your thoughts and jot down your ideas to these questions.  (Show: Delzer, F. (2015) *Reimagining Classrooms: Leaders as st* TEDxFargo talk: [https://www.youtube.com/watch ?v=w6vVXmwYvgs](https://www.youtube.com/watch?v=w6vVXmwYvgs))  I will ask you to take 3 minutes to add additional ideas to your viewing guide. Brainstorm answer to the questions on the Delzer viewing guide. We will be using your ideas later.  Next, I would like you to pair up with a person next to you or behind you. Using your notes I will ask that you and your partner each take 2 minutes to share at least 2 major “take aways” from Delzer’s video.  After 3 minutes indicate you are going into a large group discussion. Ask, “Who in here is willing to share one idea from the video?”  Take 3 minutes in a large group to share ideas and listen to students ideas about how they might use technology, social media, become active learners as teachers “give up” power, and the like.  Thank you for your time reflecting on these questions. Please put them in a safe place (you may collect them as an alternative). You will need them for tomorrow’s activity. | 2 minute  13 minutes  3 minutes  3 minutes  (time added for transitions)  3 minutes | Students will watch Delzer video  Students write notes on the viewing guide  Students reflect on the questions in the *Delzer’s Reimaging Classrooms Viewing Guide* handout.  Students add ideas to their viewing guide.  Students reflect on major ideas from video in a Think-Pair-Share format. Allocate 3 minutes for each cycle of sharing in pairs.  Students share ideas in a large group setting. |
| *Day 1 -Student Practice*  Hand out the *Strategies . . .* sheet with links to Showing Learning Growth, Educational Risk, and Digital Literacy strategies.  We’ve taken a look at how classroom can be different when students are actively engaged. Tomorrow I am going to assign you to groups and you will be discussing how you want to demonstrate and be graded on your ability to show educational growth, take positive educational risks and to demonstrate digital literacy. I want to make sure you go into this activity fully prepared. I have handed you a sheet that has links to ideas for teaching and assessing learning growth, educational risk taking and digital literacy. | 16 minutes | Students will explore the links provided. |
| *Day 1 -Cleanup*  We only have a couple of minutes left so be sure to shut down your computers (or log off if in a lab) and collect your papers. Provide directions as applicable to your situation. | 1 minute |  |
| *Day 1 - Closure*  Today we started to explore how learning growth, educational risk taking and information/digital literacy can be taught and measured. Please take time to continue your investigation and come tomorrow prepared for brainstorming and discussion. Having diverse ideas will be important for tomorrow’s activities. | 1 minute |  |
| *Day 1 - Reflection*  Hand out the *Out the Door* activity card. Get students to answer and resubmit before they leave.  \* Review and summarize students’ feedback and respond with a tweet, a post to a learning information system or a comment at the beginning of the next class to indicate you have read and value learners’ reflections and that you have addressed their concerns. Clear up questions and confusion before moving on. | 2 minutes |  |
|  |  |  |
| *Day 2 – Housekeeping*  Address concerns from previous day’s feedback if needed.  Hand back the *Educational Risk, the Learning Growth* and the *Information Technology* sheet to each student  *Day 2 - Introduce Activities*  Today we are going to bring several activities together. Several days ago you completed three surveys. I asked you to reflect on times you have taken educational risk, shown growth in your learning, and to provide feedback on the types of technologies and digital literacy skills you currently possess.  We took time yesterday to view and process Detzler’s video and a vision of what an engaged classroom might look like. Her video mentions several ideas that that included:  Review the terms and state definitions   * *Digital Literacy* * *Gatekeeper* * *Grit-* * *Innovation*- * *Problem Solving*   We took time to process main ideas from her video that asked   * How might your teachers “Release the Power”? * What kinds of technology might we use to “Embrace Purposeful Technology”? * What technology resources/social media can we use in this class to access the tools that you need to be successful (don’t feed the fear)? * How would you demonstrate that you could connect to others on a global level? * How would you like to be assessed on grit, digital literacy, citizenship and innovation (the skills of today)?   You should pull these sheets out.  Finally I asked all of you to take a look at a list of resources and we spent time looking at strategies for demonstrating appropriate educational risk taking, demonstrating learning growth and measuring digital literacy skills.  All of these activities were designed to clarify what you currently know and where you can go to find information about measuring appropriate educational risk taking, learning growth and information technologies/digital literacies. You have in fact been in the “embark and clarify” stage of the Problem Solving Pentagon that we will be discussing next week. | 3 minutes  1 minute  4 minutes | Students listen  Students listen and pull out their paper work from yesterday and collate it with the surveys you hand back |
| *Student Practice*  Assign students to get into their groups. Provide 1 minute for them to move to their assigned places.  Note: you will need to alter timing for group size and number of students/group.  We are going to use all of the information we have collected for a brainstorming activity. We will use the following process to discuss the information you have collected from the video, discussion, and surveys. Let me explain the procedure:  First, I will give your group 3 minutes to share your insights about Appropriate Educational Risk Taking  Next, I will give you 2 minutes to brainstorm as many ideas about how you would measure appropriate educational risk taking. I will ask that you work in silence.  Next, you and your group members will have 3 minutes to share and categorize your ideas.  Are there any questions?  Lead students through the process for item 1.  In the next 3 minutes please have all the group members share their major insights about educational risk taking.  After 3 minutes direct students to:  Using one sticky not per idea, please brainstorm as many ideas as you can to the following question:  Question 1: how might a student demonstrate that they are taking appropriate educational risks?  Please work on your own and without discussing your ideas with anyone else.  After 2 minutes direct students to:  Now I would like you to take your sticky notes and post them to the larger piece of poste paper labeled “Appropriate Educational Risk”. Please talk to one another as you discuss and categorize like ideas together on the larger poster paper.  Lead students through the process for item 2.  In the next 3 minutes please have all the group members share their major insights about demonstrating learning growth – how they are stretching themselves to learn new skills, behaviors, or attitudes.  After 3 minutes direct students to:  Using one sticky not per idea, please brainstorm as many ideas as you can to the following question:  Question 2: how might a student demonstrate that they are stretching themselves to learn new skills, behaviors, or attitudes?  Please work on your own and without discussing your ideas with anyone else.  After 2 minutes direct students to:  Now I would like you to take your sticky notes and post them to the larger piece of poste paper labeled “Learning Growth”. Please talk to one another as you discuss and categorize like ideas together on the larger poster paper.  Lead students through the process for item 3.  In the next 3 minutes please have all the group members share their major insights about Information Technology and Digital Literacy.  After 3 minutes direct students to:  Using one sticky not per idea, please brainstorm as many ideas as you can to the following question:  Question 3: how might a student demonstrate that they are digitally literate and can use information technologies?  Please work on your own and without discussing your ideas with anyone else.  After 2 minutes direct students to:  Now I would like you to take your sticky notes and post them to the larger piece of poste paper labeled “Information Technology/Digital Literacy”. Please talk to one another as you discuss and categorize like ideas together on the larger poster paper.  Instruct students to put their large “Information Literacy/Digital Technology” posters in one space (indicate table or wall), the larger “Learning Growth” posters in a second space and the third “Educational Risk Taking” in a third space.  Assign the existing groups to evaluate responses related to one of the following topics:   * Information Literacy/Digital Technology * Learning Growth * Educational Risk Taking   In the remaining time instruct the students to:  Please take a look at the ideas on the post it notes for your assigned topic. Using the feedback from the class please take the next 5 minutes to select the top 3 ideas that you would like to use for assessing yourselves in this class. Write your top choices on the blank piece of poster paper. Be prepared to briefly share your top ideas in a few minutes.  Keep in mind that 10 % (or the percentage you determine) of your grade will come from each of the three categories. This means that 30% of your overall grade will come from the strategies that you select for yourself during this activity.  After 5 minutes as each group to briefly share the top 3 ideas they have for assessing themselves in each of the three categories. | 1 minute  2 minutes  3 minutes  2 minutes  3 minutes  3 minutes  2 minutes  3 minutes  3 minutes  2 minutes  3 minutes  1 minutes  5 minutes  5 minutes | Students move to assigned groups  Students should discuss educational risk taking  Students brainstorm ideas  Students will discuss and categorize ideas.  Students should discuss insights related to learning growth  Students brainstorm ideas  Students will discuss and categorize ideas.  Students should discuss information technology and digital literacy  Students brainstorm ideas  Students will discuss and categorize ideas.  Students organize posters by themes/topics  Students evaluate responses on the poster paper, identify, and list the top three ideas for assessing the topic.  Students groups report out their findings to the class. |
| *Clean Up*  Please place your extra sticky notes in the center of the table. Provide directions for collecting larger poster paper with ideas.  Note: If possible post the larger poster paper with each group’s ideas around the room and leave up for several days or take pictures of the ideas and post to an online course shell for students to visit. | 1 minute | Students pick up area |
| *Closure*  Thank you all for your time and effort with this activity. We will be incorporating you feedback into the course. Indicate how soon you will provide feedback to them.  Note: You will now work to incorporate students’ ideas into the course structure. You digital literacies and the tools they use, as well as growth, can be demonstrated through wikis, websites, blogs, digital portfolios and the like. Weekly reflections can be used at the end of the semester for students to use to show growth. Figure out the tools and strategies you will use and get back to students about the results in the time you indicated. | 1 minute |  |
| *Reflection*  As we end today’s lesson I would like you to take one last sticky note. Please respond to this question and leave the answer on the Final Reflection Poster as you leave the room.   * How do today’s activities play a role in helping me define my own future? | 2 minutes | Students complete the final reflection and post responses as they leave the room |

**Teacher’s Comments/Self-Assessment:**

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**Lesson 4 Resources**

**Delzer’s *Reimagining Classrooms* Viewing Guide**

Delzer, F. (2015) *Reimagining Classrooms: Leaders as st* TEDxFargo talk: <https://www.youtube.com/watch?v=w6vVXmwYvgs>)

As you watch Delzer’s TEDx talk please jot down your reaction to the following themes that Delzer discusses. What does she ask of teachers and learners? Do you agree/disagree/indifferent?

* How might your teachers “Release the Power”?
* What kinds of technology might we use to “Embrace Purposeful Technology”?
* What technology resources/social media can we use in this class to access the tools that you need to be successful (don’t feed the fear)?
* How would you demonstrate that you could connect to others on a global level?
* How would you like to be assessed on grit, digital literacy, citizenship and innovation (the skills of today)?

**Strategies to Show Learning Growth\***

Goal-based Journaling (#13) - <https://www.create-abilities.com/blogs/create-abilities-blog/growth-mindset-strategies-to-teach-your-students>

Habits of Mind Reflection - [http://www.learningnetwork.ac.nz/shared/professional  
Reading/JAMAND5.pdf](http://www.learningnetwork.ac.nz/shared/professionalReading/JAMAND5.pdf)

Mindset Growth Rubric - [http://www.learningnetwork.ac.nz/shared/professional  
Reading/JAMAND5.pdf](http://www.learningnetwork.ac.nz/shared/professionalReading/JAMAND5.pdf)

Self- and Peer- feedback – student and/or instructor generated - <https://www.mindsetkit.org/topics/assessments-growth-mindset-math/using-self-peer-feedback-assessments-learning>

Success Folders (#14) - <https://www.create-abilities.com/blogs/create-abilities-blog/growth-mindset-strategies-to-teach-your-students>

Web page – showing growth over time or progression of project <https://www.edutopia.org/article/simple-tool-fostering-growth-mindset>

**Strategies to Demonstrate Appropriate Educational Risk Taking\***

Answer questions more often <https://mattcoaty.com/2014/06/29/risk-taking/>

Collaborate with others <https://mattcoaty.com/2014/06/29/risk-taking/>

Crumpled Reminder - <https://www.mindsetkit.org/practices/sOMwSRdLzTictvnb>

Ownership of Learning <https://mattcoaty.com/2014/06/29/risk-taking/>

Set personal performance goals <https://mattcoaty.com/2014/06/29/risk-taking/>

Strategy Box - <https://www.mindsetkit.org/practices/pPIZwxjAkjCekZJc>

**Strategies to Demonstrate Digital Literacy\***

Addressing Digital Literacy Skills for Students - <https://www.mheducation.ca/blog/addressing-digital-literacy-skills-for-students/>

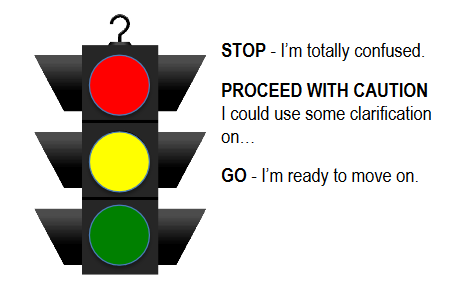
12 Essential Digital Literacy Skills - <https://www.learning.com/news/12-essential-digital-literacy-skills-integrated-core-subject-areas>

Web Resources for Digital Literacy in the Classroom - <https://www.whoishostingthis.com/resources/digital-literacy-classroom/>

**\*You are encouraged to search and brainstorm beyond the listed resources**

**Out the Door Activity cards from:** <http://eduscapes.com/sessions/ems/stop.pdf>

Example shown is from the full 8- ½ x 11 .pdf document found at the above link



Full instructions for the *Out the Door Activity # 22* and other exit strategies can be found at: <https://www.edutopia.org/blog/22-powerful-closure-activities-todd-finley>

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| --- |
| **PRE ASSESSMENT & DATA COLLECTION** |
| **Lesson Plan #5** |
| **Unit 1:** Introduction and Expectations |

|  |  |
| --- | --- |
| **Grade Level:** 10 -12 | **Instructor:** Sylvia Tiala |
| **Time Allotted:** 1- 50 minute period | **Address:** [tialasyl@gmail.com](mailto:tialasyl@gmail.com)  N4551 446th Street, Menomonie, WI |
| **School District/Organization:**  **C:\Users\Sylvia\Pictures\Sylvia Fold Logo.jpg** | **Date:** June 25, 2018 |
| **Adaptations & Acknowledgments:**  This lesson was adapted from Aerospace as well as Engineering & Virtual Problem Solving courses previously taught at Boone High School in Boone, Iowa. | |
| [Creative Commons License](http://creativecommons.org/licenses/by-nc/4.0/)**Creative Commons License Attribution:**  Problem Solving Curriculum Guide: A Process - Based Approach for Secondary Schools by Sylvia Tiala is licensed under a [Creative Commons Attribution-NonCommercial 4.0 International License](http://creativecommons.org/licenses/by-nc/4.0/) | |

**Brief Description:**

Today’s lesson focuses on collecting pre-assessment data from students. This data provides the teacher with a way to reflect on student learning, reflect on teaching, and provide evidence of effectiveness in meeting the course goals. The same assessment instruments administered at the end of the course provide teachers with data relative to changes in students’ attitudes about uncertainty and problem solving. The assessment instruments have been developed and vetted by established researchers and protocols.

**Standards**:

*Wisconsin Standards for Literacy in All Subjects:*

*Wisconsin Standards for Information and Technology Literacy:*

*Wisconsin Common Career and Technical Core Standards*

* WCCTS-CD2.b Assess attitudes and skills that contribute to successful learning

**Students’ Essential Question(s):**

* What causes some to thrive and others to struggle when facing challenges?

**Learner’s “I Can Statements”**

* I can identify my personal attitudes toward uncertainty
* I can assess my personal attitudes toward problem solving

**Assessment/Assessment Criteria**

*Formative:*

Intolerance of Uncertainty assessment (pre)

Heppner and Peterson’s *Problem Solving Inventory* (pre)

*Summative:*

Intolerance of Uncertainty assessment (post – at end of semester)

Heppner and Peterson’s *Problem Solving Inventory* (post – at end of semester)

**Materials Needed:**

Intolerance of Uncertainty assessment

Heppner and Peterson’s *Problem Solving Inventory*

An alternative to consider as a substitute is MindTools *How good is your problem solving inventory* accessed at: [https://www.mindtools.com/pages/  
article/newTMC\_72.htm](https://www.mindtools.com/pages/article/newTMC_72.htm) . No data regarding its reliability/validity is available

Instructor’s policies and procedures regarding computer network access, data storage devices and directions (accessing servers, passwords, printing), physical project storage, and the like.

**Vocabulary**

**What do I know about my students that will inform this lesson?**

Each student will have different attitudes regarding uncertainty that may impact their willingness to take academic risks. Each student will have individual perceptions about their problem solving abilities. The lesson will collect baseline data that may help instructors tailor instruction.

**How does this lesson connect with and build on previous lesson(s)?**

The assessments incorporated into this lesson will help identify how students’ attitudes toward uncertainty and problem solving change over time. Students will be able to compare and analyze how their attitudes evolved over the course of the semester and reflect on personal growth. The assessments will provide teachers the ability to demonstrate multiple sources of measurement in assessing students.

**How will I (the teacher) build upon this lesson in subsequent lessons?**

The assessments will be given as post-assessments at the end of the course enabling students and teachers to see how attitudes toward uncertainty and problem solving changed over time. Subsequent lessons address problem solving. The intention of the course is to help students build their self-efficacy in their problem solving abilities.

**Lesson Implementation**

|  |  |  |
| --- | --- | --- |
| ***Instructor Will*** | ***Time allotted*** | ***Student Will*** |
| *Prepare for class*  Instructors will need to have identified routines, rules, and procedures specific to their course and school for accessing servers, Internet permissions, project storage, passwords, and the like. The assessments listed here are provided in hard copy. Instructors have the option of creating an electronic version of their own.  Obtain permissions to use the Heppner and Peterson Problem Solving Inventory needs to be obtained from the author and publisher (see lesson resources)  Decide if assessments will be done online or with paper and pencil. Generate specific test-taking directions for the listed assessments as your situation dictates.  Develop student answer sheets for the surveys responses – hard copy or online.  Make arrangements for students needing extra time or help | 120 minutes  Insert time estimate | Not applicable |
| *Anticipatory set*  How many of you in here like to take risks?  Start a dialogue with the students to talk about risk taking, failure and academic achievement.  Can give me an example of how you took a risk when it came to your learning? When you consider your learning, do you learn more when you succeed the first time or when you have to work at something to get it right? How does risk taking and failure tie into your learning?  How many of you in here are good problem solvers? What are some examples you would like to share? | 3 minutes | Students engage in discussion with the teacher. |
| *Introduce Activities*  Today we are going to take two surveys that look at how you deal with uncertainty and how you solve problems. There is no right or wrong answers, just how you feel about the questions. We will take the surveys today and then again at the end of the semester to see if your answers changed over time. When you take a look at these surveys please answer as honestly as you can.  Let’s address these one at a time  We will start with the Intolerance of Uncertainty inventory | 1 minute |  |
| *Content*  Hand out Intolerance of Uncertainty inventory or provide directions for logging onto a website or server for an online version. Review the directions for taking the survey.  Students take the Intolerance of Uncertainty inventory. Instruct them to Please turn your survey over when you have completed it.  Walk through the scoring directions and have students score their own inventory. An option would be to put the assessment into a format that will self-grade and provide feedback to save time.  Next we are going to look at a Problem solving inventory. Hand out Heppner and Peterson’s Problem Solving Inventory. Consider developing an online version in a course management system that will score automatically to save some time. If this is done you will need to provide directions for accessing the online version of Heppner and Peterson’s Problem Solving Inventory  Walk through the directions and have students complete the inventory. Instruct them to: Please turn your survey over when you have completed it.  Note: An option would be to put the assessment into a format that will self-grade and provide feedback to save time.  Walk students through the scoring of the Problem Solving Inventory. Have them score their results | 1 minutes  5 minutes  5 minutes  2 minutes  15 minutes  10 minutes | Students take the Intolerance of Uncertainty inventory  Students will score their own Intolerance of Uncertainty inventory.  Students access Heppner and Peterson’s Problem Solving Inventory  Students complete the Heppner and Peterson’s Problem Solving Inventory  Students score their Problem Solving Inventory |
| *Student Practice*  Have a conversation with the students about their results of the inventories they completed. Find out if they feel their score reflects their intolerance of uncertainty and/or problem solving strategies. Collect individual assessments and file away for students to compare at the end of the semester reflection. | 2 minutes | Students will discuss their feelings about the Intolerance of Uncertainty inventory |
| *Clean Up*  Provide specific directions for students to turn in their assessment surveys | 1 minute |  |
| *Closure*  Today we took a look at how you feel about uncertainty and problem solving. At the end of the semester we will complete these surveys again and see if your attitudes have changed. | 1 minute |  |
| *Reflection:*  Think about today’s assessment tools and your answers. Which of your attitudes might help you be successful in this class? Which of your attitudes might provide the best opportunities for you to show growth?  Please turn in your responses to your instructor as you leave the classroom.  Note: that this reflection may help students document their growth and become part of their “self assessment” plan. The survey results here can be compared to survey results at the end of the semester. The responses to the reflection question can be returned to them at the end of the semester. Students can reflect on whether they took advantage of opportunities to show growth or if they ignored the opportunity. Consider revisiting their results mid-way through the semester and having them reflect on the results from this day’s activities. | 3 minutes | Students reflect on the question and submit answers to the course instructor. |

**Teacher’s Comments/Self-Assessment:** (use this space to reflect on what you would do differently, how the lesson unfolded, notes about students, and the like).

**References:**

Carleton, R. N., Norton, M. A., & Asmundson, G. J. G. (2007). Fearing the unknown: A short version of the intolerance of uncertainty scale. *Journal of Anxiety Disorders (21)*1, 105-117. doi: S0887-6185(06)00051-X [pii]10.1016/j.janxdis.2006.03.014

Dekkers, L. M. S., Jansen, B. R. J., Salemink, E., Huizenga, H. M. (2017). Intolerance of uncertainty scale: Measurement invariance among adolescent boys and girls and relationships with anxiety and risk taking. *Journal of Behavior Therapy and Experimental Psychiatry, 55*, 57-65.

Heppner, P. P. & Heppner, M. J, Ferrari, L, Cieno, P, Y Picotti, M. (2011, September). Helping people navigate their careers through problem solving. Retrieved from <http://larios.psy.unipd.it/conference2011/materials/12/problem_solving_symposium.pdf>.

Heppner, P. P., & Petersen, C. H. (1982). The development and implications of a personal problem-solving inventory. *Journal of Counseling Psychology, 29*(1), 66-75. [doi:10.1037/0022-0167.29.1.66](https://doi.org/10.1037/0022-0167.29.1.66)

MindTools (n. d.) *How good is your problem solving?* Retrieved from <https://www.mindtools.com/pages/article/newTMC_72.htm>

**Lesson 5 Resources**

Intolerance of Uncertainty Scale – Short Form (IUS-12)

The intolerance of Uncertainty Scale – Short From (IUS-12) will be administered as a pre-test at the beginning of the semester and again at the end of the semester. It is hypothesized that students who do not tolerate uncertainty well are less likely to take risks related to problem-solving and innovation. Teachers may want to use the measure to explore if class activities in problem solving changed students’ attitudes or if an intolerance of uncertainty may have had an impact on student learning.

The assessment, shown below, can be retrieved from: <http://www.midss.org/content/intolerance-uncertainty-scale-short-form-ius-12>



Carleton, R. N., Norton, M. A., & Asmundson, G. J. G. (2007). Fearing the unknown: A short version of the intolerance of uncertainty scale. Journal of Anxiety Disorders, 21, 105-117. doi: S0887-6185(06)00051-X [pii]10.1016/j.janxdis.2006.03.014 Retrieved from: <http://www.midss.org/content/intolerance-uncertainty-scale-short-form-ius-12>

All of the instruments submitted to the MIDSS are protected under the Creative Commons attribution non-commercial 3.0 license. The instrument cannot be used for commercial purposes without the author’s consent.

Intolerance of Uncertainty Scale – Scoring

**Prospective Anxiety: fear and anxiety based on future events**

Score

Item 1 \_\_\_\_\_\_\_

Item 2 \_\_\_\_\_\_\_

Item 4 \_\_\_\_\_\_\_

Item 5 \_\_\_\_\_\_\_

Item 8 \_\_\_\_\_\_\_

Item 9 \_\_\_\_\_\_\_

Item 11 \_\_\_\_\_\_\_

Total: \_\_\_\_\_\_\_\_

**Inhibitory Anxiety: uncertainty inhibiting action or experience**

Score

Item 3 \_\_\_\_\_\_\_

Item 6 \_\_\_\_\_\_\_

Item 7 \_\_\_\_\_\_\_

Item 10 \_\_\_\_\_\_\_

Item 12 \_\_\_\_\_\_\_

Total: \_\_\_\_\_\_\_\_

See the following article for scale and scoring development:

Carleton, R. N., Norton, M. A. P. J., Asmundson, G. J. G. (2007). Fearing the unknown: A short version of the intolerance of uncertainty scale. *Journal of Anxiety Disorders 21*(1), 105-117.

**Heppner & Peterson’s Problem Solving Inventory**

This inventory can be used as a pre- and post- problem solving inventory. Please obtain permission to use the inventory in your classroom. Permission was granted by the author to use the assessment in this document. Permission was granted to reproduce the assessment from the APA for a term of one year. If the instrument has been removed from electronic access, please use the following information to obtain the questions used in this problem solving inventory.

Directions for using Heppner & Peterson’s Problem Solving Inventory:

1. Gain access to Heppner & Peterson’s article through your local library/online. Heppner, P. P., & Petersen, C. H. (1982). The development and implications of a personal problem-solving inventory. *Journal of Counseling Psychology, 29*(1), 66-75. [doi:10.1037/0022-0167.29.1.66](https://doi.org/10.1037/0022-0167.29.1.66)
2. Refer to Table 1 for the questions used in the inventory.
3. Use the permissions area of the *Journal of Counseling Psychology* to request permission to use the assessment tool.
4. Seek permission to use the inventory and alter the introduction from Dr. P. Paul Heppner at [heppnerp@missouri.edu](mailto:heppnerp@missouri.edu)
5. Write an introductory paragraph introducing the assessment in the context which you are using the inventory.
6. Construct the inventory using a word processor or online testing site as per permission from the APA.

Dr. P Paul Heppner can be contacted at: [heppnerp@missouri.edu](mailto:heppnerp@missouri.edu)

# The Problem Solving Inventory

## Form B

P. Paul Heppner, Ph.D.

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Note, the directions have been modified from the original format

**Directions:**  People respond to problems in different ways.  The statements on this inventory deal with how people react to problems in their day-to-day life.  The term “problems” refers to technical and creative problem solving that everyone experiences at times, such as having a car that won’t start, accessing the internet with browsers that don’t work, charging electronic devices when travelling, or learning how to work with new materials like fabric or clay.  Please respond to the items as honestly as possible so as to most accurately portray how you handle such technical problems. Your responses should reflect what you actually do to solve problems, not how you think you should solve them.  When you read an item, ask yourself: Do I ever behave this way? Please answer every item.

Read each statement and indicate the extent to which you agree or disagree with that statement, using the scale provided.  Mark your responses by circling the number to the right of each statement.

1. Strongly Agree
2. Moderately Agree
3. Slightly Agree
4. Slightly Disagree
5. Moderately Disagree
6. Strongly Disagree
7. When a solution to a problem has failed, I do not examine why it didn’t work.
8. When I am confronted with a complex problem, I don’t take the time to develop a strategy for collecting information that will help define the nature of the problem.
9. When my first efforts to solve a problem fail, I become uneasy about my ability to handle the situation.
10. After I solve a problem, I do not analyze what went right and what went wrong.
11. I am usually able to think of creative and effective alternatives to my problems.
12. After following a course of action to solve a problem, I compare the actual outcome with the one I had anticipated.
13. When I have a problem, I think of as many possible ways to handle it as I can until I can’t come up with any more ideas.
14. When confronted with a problem, I consistently examine my feelings to find out what is going on in a problem situation.
15. When confused about a problem, I don’t clarify vague ideas or feeling by thinking of them in concrete terms.
16. I have the ability to solve most problems even though initially no solution is immediately apparent.
17. Many of the problems I face are too complex for me to solve
18. When solving a problem, I make decisions that I am happy with later.
19. When confronted with a problem, I tend to do the first thing that I can think of to solve it.
20. Sometimes I do not stop and take time to deal with my problems, but just kind of muddle ahead.
21. When considering solutions to a problem, I do not take the time to assess the potential success of each alternative.
22. When confronted with a problem, I stop and think about it before deciding on a next step.
23. I generally act on the first ideal that comes to mind in solving a problem.
24. When making a decision, I compare alternatives and weigh the consequences of one against the other.
25. When I make plans to solve a problem, I am almost certain that I can make them work.
26. I try to predict the result of a particular course of action.
27. When I try to think of possible solutions to a problem, I do not come up with very many alternatives.
28. When trying to solve a problem, one strategy I often use is to think of past problems that have been similar.
29. Given enough time and effort, I believe I can solve most problems that confront me.
30. When faced with a novel situation, I have confidence that I can handle problems that may arise.
31. Even though I work on a problem, sometimes I feel like I’m groping or wandering and not getting down to the real issue.
32. I make snap judgements and later regret them.
33. I trust my ability to solve new and difficult problems.
34. I use a systematic method to compare alternatives and make decisions.
35. When thinking of ways to handle a problem, I seldom combine ideas from various alternatives to arrive at a workable solution.
36. When faced with a problem, I seldom assess the external forces that may be contributing to the problem.
37. When confronted with a problem, I usually first survey the situation to determine the relevant information.
38. There are times when I become so emotionally charged that I can no longer see the alternatives for solving a particular problem.
39. After making a decision, the actual outcome is usually similar to what I had anticipated.
40. When confronted with a problem, I am unsure of whether I can handle the situation.
41. When I become aware of a problem, one of the first things I do is try to find out exactly what the problem is.

PSI SELF-SCORING SHEET

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Instructions:

Scoring the PSI is a matter of summing the responses to each item (1-6) for each of the three factors. The times constituting each factor are listed below.

1. The first step is to transfer your answers (1-6) for the inventory to each of the corresponding blanks on this scoring sheet.
2. Second, note that some items are worded negatively, and scoring of these items must be reversed. These items are indicated by asterisks, and are followed by an equal sign (=) and an additional blank. Thus, for these items, reverse the numbers in the following fashion on all of those items which have additional blanks.

1 = 6

2 = 5

3 = 4

4 = 3

5 = 2

6 = 1

1. Third, simply sum the responses together for each factor (being careful to add any reversed number). Record the factor score.
2. Finally, add the three factor scores for the PSI total score. Do not add the three filler items in any way.

Self-Scoring the PSI

Factor one: Problem Solving Confidence

5. \_\_\_\_\_ 24. \_\_\_\_\_

10. \_\_\_\_\_ 27. \_\_\_\_\_

11.\* \_\_\_\_\_ = \_\_\_\_\_ 33. \_\_\_\_\_

12. \_\_\_\_\_ 34.\* \_\_\_\_\_ = \_\_\_\_\_

19. \_\_\_\_\_ 35. \_\_\_\_\_

1. \_\_\_\_\_

# FACTOR 1 SCORE \_\_\_\_\_

# Factor two: Approach-Avoidance Style

1.\* \_\_\_\_\_ = \_\_\_\_\_ 16. \_\_\_\_\_

2.\* \_\_\_\_\_ = \_\_\_\_\_ 17.\* \_\_\_\_\_ = \_\_\_\_\_

4.\* \_\_\_\_\_ = \_\_\_\_\_ 18. \_\_\_\_\_

6. \_\_\_\_\_ 20. \_\_\_\_\_

7. \_\_\_\_\_ 21.\* \_\_\_\_\_ = \_\_\_\_\_

8. \_\_\_\_\_ 28. \_\_\_\_\_

13.\* \_\_\_\_\_ = \_\_\_\_\_ 30.\* \_\_\_\_\_ = \_\_\_\_\_

15.\* \_\_\_\_\_ = \_\_\_\_\_ 31. \_\_\_\_\_

**FACTOR 2 SCORE \_\_\_\_\_\_**

## Factor three: Personal Control

3.\* \_\_\_\_\_ = \_\_\_\_\_ 26.\* \_\_\_\_\_ = \_\_\_\_\_

14.\* \_\_\_\_\_ = \_\_\_\_\_ 32.\* \_\_\_\_\_ = \_\_\_\_\_

25.\* \_\_\_\_\_ = \_\_\_\_\_

**FACTOR 3 SCORE \_\_\_\_\_**

**Filler items (Do Not Include in Scoring)**

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

**TOTAL PSI SCORE \_\_\_\_\_**

**UNIT 2**

**Embark and Clarify**

|  |
| --- |
| **PROBLEM SOLVING PENTAGON** |
| **Lesson Plan #6** |
| **Unit 2:** Embark & Clarify |

|  |  |
| --- | --- |
| **Grade Level:** 10 -12 | **Instructor:** Sylvia Tiala |
| **Time Allotted:** 1- 50 minute period | **Address:** [tialasyl@gmail.com](mailto:tialasyl@gmail.com)  N4551 446th Street, Menomonie, WI |
| **School District/Organization:**  **C:\Users\Sylvia\Pictures\Sylvia Fold Logo.jpg** | **Date:** June 25, 2018 |
| **Adaptations & Acknowledgments:**  This lesson was adapted from Aerospace as well as Engineering & Virtual Problem Solving courses previously taught at Boone High School in Boone, Iowa. | |
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**Brief Description:**

The Problem Solving Pentagon is a framework for conducting research and problem solving across disciplines. This mode for problem solving was specifically chosen as it was developed, and has been shown, to work across disciplines and subjects.

**Standards**:

*Wisconsin Standards for Literacy in All Subjects:*

* RH-3 Evaluate explanations
* RH-7 Integrate multiple sources of information in diverse formats
* RST-5 Analyze how information is categorized
* RST-7 Integrate and evaluate multiple sources of information
* SL-1 Participate in collaborative discussions
* SL-2 Integrate multiple sources of information
* SL – 4 Present information and supporting evidence clearly
* SL-6 Adapt speech to a variety of contexts
* L-1 Demonstrate command of English when speaking
* L-3 Use language and it’s conventions while speaking

*Wisconsin Standards for Information and Technology Literacy:*

* ITL-DC2.a Use information, media and digital resources in a responsible manner
* ITL-KC1.a Plan and employ effective research strategies
* IL-KC1.c Locate and organize resources from various sources
* ITL-ID1.z Find authentic problems locally
* ITL-ID1.b Exhibit tolerance for ambiguity
* ITL-ID2.a Know and use a deliberate design process

*Wisconsin Common Career and Technical Core Standards*

* WCCTS-4c1.a Develop original solutions
* WCCTS-4c1.b Work creatively with others
* WCCTS-4c2.a Develop effective resolutions for a given problem
* WCCTS-4c2.b Develop a resolution using personal knowledge and experience
* WCCTS-4c3.a Communicate thoughts and feelings with others
* WCCTS-4c3.b Work collaboratively with others
* WCCTS-CD1. B Demonstrate effective decision making & problem solving
* WCCTS-CD1.d Apply a range of decision making strategies
* WCCTS-CD4.d Develop positive relationship with others
* WCCTS-IMT1a Choose appropriate sources of data and information
* WCCTS-IMT1.b Determine relevance of information
* WCCTS-IMT1.c Select relevant information for making decisions
* WCCTS-IMT1.d Apply data and information
* WCCTS-IMT3.b Select and use communication technology to solve problems

**Students’ Essential Question(s):**

* Is there a process I can use to solve problems?

**Learner’s “I Can Statements”**

* I can clarify what is needed in a given problem
* I can consider multiple sources to get started finding solutions to a problem
* I can communicate with others when solving problems
* I can apply what I know to a given problem
* I can find information needed to solve a problem
* I can look at sources of information and determine if they are relevant to my problem
* I can organize and manage the information that I collect
* I can analyze information I find to use in the decision-making process
* I can synthesize information to make a decision

**Assessment/Assessment Criteria**

*Formative:*

Listen to students’ explanations & discussions

Watch students interacting with others

Students will be able to reflect appropriately on:

1. What takeaways from the lesson will be important to know three years from now?

*Summative:*

Students will be able to connect their problem solving process with the Problem Solving pentagon

Students will be able to identify what problem solving skill sets they are using throughout the course

**Materials Needed:**

Hiking Wisconsin Handout – 1 /student group – 2 to 4/group recommended

Problem Solving Pentagon – 1 copy/student

Student access to the internet or brochures and information about hiking trails in Wisconsin

Notecards/half-sheets of paper for final reflection question

**Vocabulary**

**What do I know about my students that will inform this lesson?**

Students will do well planning the hike. Attend to group discussions as they plan their hike. What kind of food are they taking? Personal experience or lessons from adults (i.e. food poisoning if using mayonnaise) provide talking points about personal experience being a valid source of information. It speaks to authority in that more experienced individuals – whether they have degrees or not – may be an “authority”. Looking at weather indicates that students are consulting a variety of sources. This allows a discussion of authority and reliability (i.e. can the weather forecast be trusted?) What kind of models are used? How is information displayed and conveyed. Weather data is modeled in numbers, graphs, pictures, audio reports and the like (This will help you reference modeling later in the semester). Ask how students selected their trail. Information is gleaned about groups. Are they adventurous and are trying something new based on Internet reviews? Is there a person in the group who knows the trails? Ask probing questions to see if they were constrained by time, lacked effort to explore options, had an individual with a strong personality, or if they really liked the trail. The idea is to make the students’ thinking visible so you can look at how they are thinking about the research process.

The second part of the exercise asks students to connect the process they used to the Problem Solving Pentagon. Students will have difficulty getting started with this. Have a couple of examples ready. For example – when they are problem solving they are involved in the communicating and apply process. This same process is used if they are on the Internet as they are actually communicating with a piece of hardware as they do internet searches. They are communicating as they discuss in large and small groups. If someone in the group writes down information and categories it can be used as an example of organizing and managing information. Asking students why they chose a particular trail has them analyzing, reflecting and evaluating. Get students started with a few examples and then be prepared to visit the small groups and help them connect.

**How does this lesson connect with and build on previous lesson(s)?**

Relationships have been established during the first week of school. This group work has students continuing to work with one another. It introduces the problems solving process they will use during the rest of the semester. When possible emphasize that the model can be used whenever they are solving problems whether it is in other classes or in their own lives (buying a car = commonly known; buying a house = commonly known).

**How will I (the teacher) build upon this lesson in subsequent lessons?**

The problem solving process and the particular facets of the problem solving pentagon should be referenced whenever possible during the remainder of the semester. This strategy is intended to make the problem solving process and its steps clear for all students.

**Lesson Implementation**

|  |  |  |
| --- | --- | --- |
| ***Instructor Will*** | ***Time allotted*** | ***Student Will*** |
| *Prepare for class*  Students will need to move from the U- shaped seating to clustered groups. Arrange the room accordingly.  Read the Willison & O’Regan article posted in the reference section  Determine groups of 2 – 4 for the activity  Review the Problem Solving Pentagon  Make copies of the Hiking Exercise and Problem Solving Pentagon for each student  Note: More information regarding the RSD framework can be found at:  <https://www.adelaide.edu.au/rsd/>  A short tutorial on teaching undergraduate research may be helpful for review and can be found (as of July 3, 2018) at [http://www2.uwstout.edu /content/lib/tutorial/under graduateresearch/index.html](http://www2.uwstout.edu/content/lib/tutorial/undergraduateresearch/index.html)  Write the student “I can” statement on the board | 60 minutes for reading and copying | Not applicable |
| *Anticipatory set*  (Pass out/have pentagons on desks) Throughout this course you will be using a problem solving process for daily assignments and semester-long assignments. In fact, the process we will look at today can be used in any class and for solving your every-day problems. Please take a look at today’s “I can” statements. These are skills you will need throughout your life, not just in this class. Today we are going to take a look at how those “I can” statements apply to your everyday life. Let’s get started. You will see a pentagon on the paper in front of you.  What is one of the facets? (Call on student). Repeat until the 6 facets are named.  These six spaces, or facets if you will, represent the stages you will go through when you solve a problem.  Let’s take a look. | 2 minutes | Learners will look at the Problem Solving Pentagon and be able to tell you what they are. |
| *Introduce Activities*  Today we will be doing two things. First we will solve a problem.  Next we will look at the problem we solved and relate it back to the Problem Solving Pentagon.  The reason for this is so that all of us become familiar with the overall problem solving process that we will be using throughout the semester. | 1 minute |  |
| *Introduce Activities*  (Hand out the Hiking Wisconsin sheet to the groups).  I have a simple problem for you to solve today.  Here are the directions:  Review the directions on the handout.  If students ask questions such as:  Are we limited to where we can go? Can we go out of state?  Can we take an airplane?  Let them know that the directions they need are provided. Refrain from giving too many answers.  Indicate: You may use the internet and your computers/phones (indicate technologies available) to complete the assignment.  You have 18 minutes to plan your hike.  Note: At this point in time you will be looking for connections between the problem solving pentagon and their thinking and research processes. Wander the room, answer questions but avoid “giving answers”. Listen and watch for talking points. The real lesson is in the debriefing.  After 18 minutes ask students to stop what they are doing. Have one person from each of the groups report out where they are going, what food they will take and how they reached their decisions of where they would go. | 17 minutes  10 minutes total to report out | Students strategize how to plan a hike followed by planning a hike.  Students listen as groups report out where they will go on their hiking trip |
| *Student Practice*  Now I want you to use the next 8 minutes to think about the process you used to plan your hike. Think about how you solved the problem. For example, how do you get started with this activity?  -Keep prodding until the students can identify that they were given instructions to plan a hike by you, the teacher. Help them identify that this was the “embark and clarify” stage. If students had asked you for specific information that you did not answer very well – connect that to the idea that you want them to wrestle with issues that at times may be vague. Ask them where they found information. If they used the internet you can connect their answers to the “finding and generating” and/or evaluating stages.  After you provide a couple of examples, have the students work in groups to link to the other facets of the problem solving pentagon.  After 8 minutes bring students back together. Have a person from each group provide one example of the connection they made to one of the facets. Continue the discussion helping students see examples from the process they just completed to the various facets of the research process. See the *Hiking Wisconsin Discussion Questions/ Observations* sheet for discussion prompts. Point out that a) problem solving is a messy non-linear process and b) sometimes the activities they are doing fall into more than one category. | 8 minutes  8 minutes | Students will report work to link their thinking and problem – solving process to the problem solving pentagon.  Students will report out how their thought processes linked to the problem solving pentagon. |
| *Clean Up*  Have students move chairs and tables back into the necessary position. Pick up papers, and tidy the room | Insert time estimate  1 minute | Students will clean the area |
| *Closure*  Who can tell me why today’s activity is important.  Have students intentionally refer back to the “I can “ statements if needed. | 2 minutes | Students should be able to indicate that the problem solving pentagon represents a process that they can and will use every day.  Students should be able to indicate that the process will be used throughout the class. |
| *Reflection:*  Use Finley’s (<https://www.edutopia.org/blog/22-powerful-closure-activities-todd-finley>) “So What” strategy to help students reflect. | 2 minutes | Students will take 2 minutes to answer:   1. What takeaways from the lesson will be important for you to know three years from now? 2. Why? |

**Teacher’s Comments/Self-Assessment:** (use this space to reflect on what you would do differently, how the lesson unfolded, notes about students, and the like).

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**For information and/or workshops on implementing the Problem Solving Pentagon, the Models for Engaged Teaching & Learning/Research Skill Development Framework please contact**:

Sylvia Tiala: [sylviatiala@gmail.com](mailto:sylviatiala@gmail.com)

N4551 446th Street

Menomonie, WI 54751

715-523-9060

**Lesson 5 Resources**

**Hiking Wisconsin**



For hiking trails in Wisconsin please see:

<http://www.travelwisconsin.com/things-to-do/outdoor-fun/natural-attractions-parks/trails-hiking/directory>

Surprise! Your friends are coming for a weekend visit this coming weekend. They have heard about the great hiking opportunities in Wisconsin. It is up to you to plan a day of hiking adventure for you and your family. Please plan a hiking activity that:

1. Is a minimum of 4 hours in length – not including travel time.
2. Is suitable for the physical condition of your friends
3. Includes appropriate safety precautions (i.e. sunscreen)
4. Includes plans for coping with weather conditions this time of year
5. At least one meal must be consumed on the trail

***RSD pentagon***

**Retrieved from:** [**https://www.adelaide.edu.au/rsd/framework/simpler/**](https://www.adelaide.edu.au/rsd/framework/simpler/)

**Communicate & Apply**

*How do we relate?*

**‘When in doubt, return to the centre’**

The Research Skill Development (RSD) pentagon is based on the six facets of the RSD as modified for Optimising Problem Solving (OPS) pentagon designed by Mechanical Engineering Communications Tutors, University of Adelaide, 2014. See [www.rsd.edu.au](http://www.rsd.edu.au) for full version of RSD and <http://www.adelaide.edu.au/rsd/framework/frameworks/> for OPS. john.willison@adelaide.edu.au

The RSD Pentagon may be used as a Thinking Routine (R. Ritchhart & D. Perkins, 2008).

**Organize & Manage**

*How do we arrange?*

**Evaluate & Reflect**

*What do we trust?*

**Analyze &**

**Synthesize**

*What does it mean?*

**Find &**

**Generate**

*What do we need?*

**Embark & Clarify**

*What is our purpose?*

[ask questions, define problems or set aims.]

**Hiking Wisconsin Discussion Questions/ Observations Prompts**

*Note: It is important to walk around room and listen/observe groups working so you can tie the process they used to the facets of the Problem Solving Pentagon. Examples of questions to ask and expected student responses are provided below.*

**Embark and Clarify**

* *How did you know how to get started on planning a hike?* (Learners should be able to identify that you provided the directions)
* *Did any of you ask questions? What were they? How much information did I give you?* (Students should be able to identify that the instructors gave them printed directions and little detail beyond that. They should be able to discuss that they spoke with one another, asked questions, and other techniques as they started the assignment).

**Find and Generate**

* *How did you decide where you would go hiking?* (Students will respond with the internet, people in their group, personal experience).
  + This is an opportunity to discuss that personal experience, friends, and family can sometimes serve as “experts” to be consulted.

**Evaluate and Reflect**

* *Did any of you look at a weather forecast? Do you trust the forecast? Why or why not?* (Students may not have taken time to look at the forecast or trusted the forecast that they consulted. Many will say that their experience with the weather forecasting has been relatively accurate and they “just trust it”).
  + These questions provide a time for you to discuss the importance of reliable information. The weather forecast is not always accurate. Relate this to research/problem solving by having learners consult reputable sources that are trustworthy.
* *Why are you taking they type of food you chose? How do you know it is safe?* (Learners will respond with answers such as “I just know”. Further prodding will lead to them divulging they learned this from personal experience, family members, and the like).
  + These questions provide an opportunity to describe expertise as contextual. For example parents or personal experience might lead one to “know” that mayonnaise and other foods may cause food poisoning if they get hot and grow bacteria. Sometimes personal experience can be valid. However, it is important to consult the right kind of “expert” – research and literature reviews – in other cases. Multiple sources of information should be consulted during “research/problem solving” process.

**Organize and Manage**

* How did you organize and manage your information? (Learners should be able to indicate that they made a chart, took notes, doodled or in some way kept track of the information that was being discussed).

**Analyze and Synthesize**

* What information did you consider as you planned your hike? (Learners should be able to talk about the variety of information they considered not limited to: food, physical condition and age of family members, weather, group member’s ideas and expertise, and how the process came together).

**Communicate and Apply**

* *How did you communicate during the exercise?* (Learners should be able to identify that they talked with one another in small groups and that they are communicating in large groups. With prompting they should also be able to identify that they used technology – phones or computers – to access information and communicate with machines and information networks).

|  |
| --- |
| **FINDING RELEVANT/ISSUES PROBLEMS** |
| **Lesson Plan #7 – Personal, Friends and Family** |
| **Unit 2:** Embark & Clarify |

|  |  |
| --- | --- |
| **Grade Level:** 10 -12 | **Instructor:** Sylvia Tiala |
| **Time Allotted:** 1 - 50 minute periods | **Address:** [tialasyl@gmail.com](mailto:tialasyl@gmail.com)  N4551 446th Street, Menomonie, WI |
| **School District/Organization:**  **C:\Users\Sylvia\Pictures\Sylvia Fold Logo.jpg** | **Date:** June 25, 2018 |
| **Adaptations & Acknowledgments:**  This lesson was adapted from Aerospace as well as Engineering & Virtual Problem Solving courses previously taught at Boone High School in Boone, Iowa. | |
| [Creative Commons License](http://creativecommons.org/licenses/by-nc/4.0/)**Creative Commons License Attribution:**  Problem Solving Curriculum Guide: A Process - Based Approach for Secondary Schools by Sylvia Tiala is licensed under a [Creative Commons Attribution-NonCommercial 4.0 International License](http://creativecommons.org/licenses/by-nc/4.0/) | |

**Brief Description:**

This lesson has learners looking for potential problems and issues that are relevant for the students, their passions, and the community they live in. This is an exploration phase that starts with friends and family who students should feel comfortable with. Note that this is a collection phase only. Students’ identified problems and issues will be vetted at a later date in the course.

**Standards**:

*Wisconsin Standards for Literacy in All Subjects:*

* RH-2 Determine central ideas, provide accurate summaries
* SL-1 Initiate/participate in a range of collaborative discussions
* L-1 Demonstrate command of English when speaking and writing

*Wisconsin Standards for Information and Technology Literacy:*

* ITL-KC1.a Plan and employ effective research strategies
* ITL-ID1.z Find authentic problems in local and global contexts
* ITL-ID1.b Exhibit tolerance for ambiguity
* ITL—ID2.a Know and use a deliberate design process

*Wisconsin Common Career and Technical Core Standards*

* WCCTS-4c3.a Communicate thoughts and feeling with others
* WCCTS-IMT1.c Select relevant information necessary for making decisions

**Students’ Essential Question(s):**

* How can small actions have a larger impact on my community/the world?

**Learner’s “I Can Statements”**

* I can identify what types of problems are suited for this course
* I can communicate with others
* I can identify what relevant information I have to solve a problem
* I can treat others respectfully
* I can summarize main ideas from a video presentation
* I can determine how concepts discussed in class apply to me personally

**Assessment/Assessment Criteria**

*Formative:*

Observe students working respectfully with peers

Note students’ willingness to participate in discussions

Observe the number of ideas that students generate and contribute

Notes from *Impossible to Possible* viewing guide

*Summative:*

Problem solving process documented as part of final project

**Materials Needed:**

Digital Projector

Internet Access

Mick Ebeling’s TED Archive video at: <https://www.youtube.com/watch?v=ihzObEqvcHY>

Example problems from family and friends – copy those from resources or use your own onto a power point/print out

Problem solving pentagon handout (should have been disseminated earlier in the semester – post it in the classroom and/or provide students with extra copies.)

Sticky notes or ¼ sheets of paper and tape for brainstorming posts

Larger poster paper for organizing sticky notes - 1 sheet for every 4 students hung far enough apart to allow groups of students to work together without interfering with one another.

**Vocabulary**

Mashup – mixing two different types of creative works

**What do I know about my students that will inform this lesson?**

Students will have varying degrees of problem solving skills. Some students may not be able to differentiate the types of problems they will be solving during your class. Make sure that today’s lesson helps set parameters for the types of problem solving activities you will consider. The lessons, as written, focus on access to digital fabrication equipment such as 3D printers, milling machines, laser engravers, vinyl cutters and other similar tools. Solving problems of a social nature, getting people to voting polls, human trafficking, spousal abuse, and the like, are not the focus of the course as written. The course could be adapted for these types of problems. Be aware that you need to specifically indicate the types of problems you will be expecting as part of course activities. Alter the lesson plan to meet your needs.

**How does this lesson connect with and build on previous lesson(s)?**

The problem solving pentagon was introduced in the last lesson. This lesson addresses the “Embark & Clarify” aspect of problem solving.

**How will I (the teacher) build upon this lesson in subsequent lessons?**

Subsequent lessons will focus on different aspects of the problem solving process. Eventually students will have been scaffolded through the problem solving process as they complete their problem solving projects.

**Lesson Implementation**

|  |  |  |
| --- | --- | --- |
| ***Instructor Will*** | ***Time allotted*** | ***Student Will*** |
| *Prepare for class*  This is part of a series of lessons where you will be scaffolding students as they walk through the problem solving process. It will be helpful to look at problem solving frameworks that encourage problem solving, critical thinking, and innovation in a variety of contexts.  Examples for your consideration should not be limited to:  Big 6 (2017). *Big 6 skills overview*. Retrieved from <http://www.big6.com/pages/about/big6-skills-overview.php>.  Global Digital Citizen Foundation. (n. d.). *The essential fluencies*. Retrieved from <https://globaldigitalcitizen.org/21st-century-fluencies>  Just Associates.org  [https://justassociates.org/sites /justassociates.org/files/14chap9 \_analyzing\_prob.pdf](https://justassociates.org/sites/justassociates.org/files/14chap9_analyzing_prob.pdf)  University of Adelaide (2018). *Research skill development for curriculum design and assessment.* Retrieved from <https://www.adelaide.edu.au/rsd/>  Watch: Watch Mick Ebeling’s (2016) Ted talk: *Making the Impossible Possible* [https://www.youtube.com/watch?v =ihzObEqvcHY](https://www.youtube.com/watch?v=ihzObEqvcHY) and be able to relate concepts in the video to the viewing guide.  Write vocabulary words on the board  Hang larger sheets of poster paper around the room that students can use to post their sticky notes. It would be helpful if these poster pages could be left hanging in the classroom for several days. If not, then hang them up for students to see during their respective class times. Take pictures of the posted items and digitally post them in addition/as an alternative  Post a link to an optional video: Ebeling’s TED talk *The invention that unlocked a locked-in artist* at [https://www.youtube.com /watch?v=Sktdq5z1N-4](https://www.youtube.com/watch?v=Sktdq5z1N-4)  Post homework assignment:  Find out who Peter Smart is:  Post inks to Peter Smart’s blog post *50 design problems in 50 days* [*https://www.smashingmagazine.com/2013/05/50-problems-50-days-part-1-real-empathy-innovation/*](https://www.smashingmagazine.com/2013/05/50-problems-50-days-part-1-real-empathy-innovation/)and the accompanying graphic <http://50problems50days.com/>  Post links to the local/regional newspaper so students can access articles. Be sure to refer students to your library for access to news articles as well. Be sure and work with your school librarian/media specialist. | 20 minutes to watch Ebeling TED talk and tie ideas to viewing guide. | Not applicable – teacher preparation |
| *Anticipatory set*  Good morning/afternoon everyone. Who can tell me what a mashup is? Get a definition from students. Clarify as needed  Today we are going to look at the *Embark and Clarify* portion of the problem solving process. I would like to show you a TED talk by Mick Ebeling who is a designer with a message, “Find Your One”. This speaks to how one person embarked, or started, on his own problem solving process.  I am handing out a video guide with some key ideas. Let’s take a look at them (have students read to themselves or quickly review). Which one of these do you find the most interesting (this is a check to see if they were read)?  As you watch the video attend to these questions and jot down notes and ideas.  Watch Ebeling (2016) Ted talk: [https://www.youtube.com/watch?v =ihzObEqvcHY](https://www.youtube.com/watch?v=ihzObEqvcHY)  At the end of the video give students a chance to add ideas to their papers  Have them share their ideas in pairs/small groups  Discuss as a large group. | 4 minutes for the intro  8 minutes watch video  3 minutes  5 minutes  4 minutes | Students will define “mashup”  Students will review the *Making the Impossible Possible* viewing guide and:   1. Respond to teacher’s inquiry 2. Jot down notes during the video 3. Share ideas and reflect on the video as directed by the teacher |
| *Introduce Activities*  This course is about problem solving. We will spend a large portion of the semester working on problems that you pick. In order to do this, we will need to identify problems. If you look at your problem solving pentagon you will notice that one of the facets is embark and clarify.  This week we will be following in the footsteps of Peter Smart. We will find problems to solve and clarifying what additional information may be needed. The activities we do this week will help you decide:   1. What project you want to work on throughout the semester   These activities are part of the larger problem solving process that will eventually help you decide   1. Who you will be working with 2. What resources you have available.   We will finish today by thinking about our family and friends and looking at the types of problems we might be able to impact.  Let’s get started. | 2 minutes |  |
| *Content*  Note: Use these examples or tweak with examples of your own. You can alter the pronouns and contexts as needed.  Family and friends can are a good place to start when looking for problems. Here are two examples. First, there is an email I received asking for help. You will notice that this poor rooster, Rod Stewart, had a leg and part of a foot frozen off during the winter. My friends emailed me to see if I could help make artificial legs for him.  The second example comes from my (friend’s) father, who is 90 years old. He had a birth defect that impacted his ability to use his right hand for fine motor skills like writing and holding small objects. He learned to use his left hand for these tasks. At first you would think the problem would be his ability to use his right hand. The problem was actually in his left hand. He is no longer able to grip with his left hand. There is no strength in his fingers and all he can do is grab utensils and pens in a pincher grip like you would do if you were wearing mittens. This impacts his ability to write, eat, open packages, hold drinking glasses and finally to use his television remote.  All of these have some elements in common. Take a minute and think about what the video, and these example have in common. These elements help define the types of problems we will be solving during this class.  Can anyone tell me what some of these elements are?  Students should be able to identify that  1. Technology is needed  2. Helps people/animals adapt to their surroundings.  3. The problem that is selected may help solve 1 problem or help 1 person but the solution may be able to extend to a larger audience (more people/audiences).  This is where you will clarify that the problems to be solved have a technical element associated with them. The design process requiring a technical product (mechanisms, computer code, signage, etc.) needs to be a part of the problem. It is helpful if students can see that empathy and problem solving have secondary impacts to a larger community/society as well. | 4 minutes | Students listen  Students think about and talk about elements common to the presented scenarios |
| *Student Practice*  Hand out a stack of sticky notes to each student  I would like you to think about yourself, your family and friends. Do any of them need help doing chores, getting around or need more convenience in their life? How about pets, farm animals, or other wildlife near your home? Do any of them face problems or inconveniences?  I want you to brainstorm as many ideas as you can. Write down one, and only one idea, per sticky note. Use as many sticky notes as you need.  I will ask that you do this by yourself and generate as many ideas as you can think of. I will give you 3 minutes. OK, let’s start.  Now that you have brainstormed several ideas I am going to ask that we post our ideas in the following way.  Assign students to groups of 3 -4/group  Direct students to post their ideas to the larger poster paper:  I want you to work in groups to post your ideas. I will ask that you take your sticky notes and put them on the larger poste paper that you see hanging around the room. Group 1 will use (assign poster), group 2 will use (assign poster space). Continue until all students assigned a poster space.  As you post your ideas I want you to talk to each other and see if you can group your ideas into categories. Are there similarities between your ideas? After 5 minutes I will ask one person from your group to summarize and share what you have found  After 5 minutes have a person from the group share the major findings/themes. Alternatively you can have each group share one idea and then rotate through one idea/group until the major categories and ideas have been shared.  Take a minute to summarize what types of problems students identified and how it is the start of the problem solving process with ties to the problem solving pentagon. | 1 minute  3 minutes  2 minutes  5 minutes  5 minutes | Students brainstorm ideas on sticky notes.  Students post their sticky notes  Notes are organized  Students share ideas |
| *Clean Up*  Please take your unused sticky notes and put them on a pile on your desk (or however you want them organized and returned). Provide other directions for cleaning up and organizing the room. | 2 minutes. | Students clean up as per directions |
| *Closure*  Today we started looking at potential problems or obstacles our friends and families face. We started generating a list of ideas for problem solving. We will continue the process tomorrow.  In the mean time I will encourage you start thinking like a detective and try to spot potential problems to work on. Some of you may be interested in looking at another project Mick worked on. If you are interested you can find his TED talk at:  Ebeling’s TED talk *The invention that unlocked a locked-in artist* at [https://www.youtube.com /watch?v=Sktdq5z1N-4](https://www.youtube.com/watch?v=Sktdq5z1N-4).  Tomorrow we will have a competition between groups. You will be randomly assigned to groups so you don’t know who your partners are going to be. Please prepare for tomorrow by doing three things: (Post these to a course management system, write on the board, or make assignment clear for the students)   1. Go online and find out who Peter Smart is. You can find him at: <https://www.smashingmagazine.com/2013/05/50-problems-50-days-part-1-real-empathy-innovation/> 2. Take a look a the 50 problems Peter Smart Solved in 50 days at: <http://50problems50days.com/> 3. Start looking around in your classes and in newspapers that could use some of your problem solving expertise.   Note: Take the larger posters with students’ sticky notes and post them in the room for the next several days. Consider taking pictures of the responses and posting photos to an online course management system or a place where students can access the responses. | 1 minute | Student may choose to watch the video  Students may complete this homework assignment. It may be difficult if there is no internet access at home. |
| *Reflection\**  I would like you to take a minute and let me know your thoughts about this question: How can small actions on your part have a larger impact on your community and/or the world?  Provide directions for students to leave their cards with you at the end of class  \* Review and summarize (avoid calling out individual students’ ideas publically) students’ feedback and respond with a tweet, a post to a learning information system or a comment at the beginning of the next class to indicate you have read and value learners’ reflections. Consider a positive note to students and/or parents making sure that each student in the class gets positive feedback in an equitable fashion throughout the semester. | 1 minute | Students complete the reflection |

**Teacher’s Comments/Self-Assessment:** (use this space to reflect on what you would do differently, how the lesson unfolded, notes about students, and the like).

**References:**

Ebeling, M. (2011, April 7). *The invention that unlocked a locked-in artist* [Video file]. Retrieved from <https://www.youtube.com/watch?v=ihzObEqvcHY>

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Watanabe-Crockett, L. (2017, November 16). *Over 100 awesome essential question examples by subject.*  Retrieved from <https://globaldigitalcitizen.org/100-awesome-essential-questions>.

**Lesson 7 Resources**

Making the Impossible Possible Viewing Guide

Mick Ebeling: Making the impossible possible @ <https://www.youtube.com/watch?v=ihzObEqvcHY>

**Key Ideas:**

What experience does Mick bring together to solve problems?

How has Mick’s use of technology changed over time?

What needs is Mick trying to meet in making the impossible possible?

What’s the role of “the story” in the problem solving process?

What does it mean when Mick refers to “the one”

How does Mick find problems that he wants to work on?

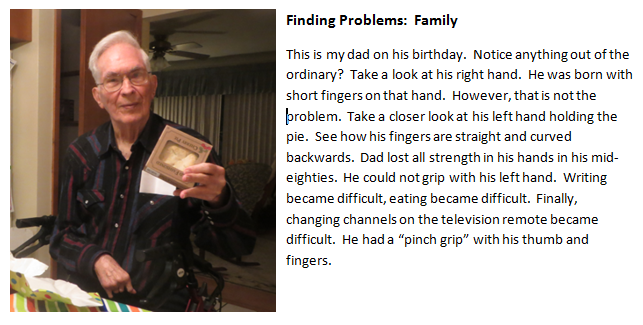
What kinds of failure occurred were mentioned in Mick’s video?

What kinds of risks did Mick face in his adventure?

How might Mick’s ideas apply to you?

### Example Problems from Family and Friends

### 



|  |
| --- |
| **FINDING RELEVANT/ISSUES PROBLEMS** |
| **Lesson Plan #8 – Community & Online Resources** |
| **Unit 2:** Embark & Clarify |

|  |  |
| --- | --- |
| **Grade Level:** 10 -12 | **Instructor:** Sylvia Tiala |
| **Time Allotted:** 2 - 50 minute periods | **Address:** [tialasyl@gmail.com](mailto:tialasyl@gmail.com)  N4551 446th Street, Menomonie, WI |
| **School District/Organization:**  **C:\Users\Sylvia\Pictures\Sylvia Fold Logo.jpg** | **Date:** June 25, 2018 |
| **Adaptations & Acknowledgments:**  This lesson was adapted from Aerospace as well as Engineering & Virtual Problem Solving courses previously taught at Boone High School in Boone, Iowa. | |
| [Creative Commons License](http://creativecommons.org/licenses/by-nc/4.0/)**Creative Commons License Attribution:**  Problem Solving Curriculum Guide: A Process - Based Approach for Secondary Schools by Sylvia Tiala is licensed under a [Creative Commons Attribution-NonCommercial 4.0 International License](http://creativecommons.org/licenses/by-nc/4.0/) | |

**Brief Description:**

In this lesson, learners look for potential problems and issues that are relevant for themselves, their passions, and the community they live in. This exploration phase continues from the previous day’s lesson in the form of a group competition. It ties to yesterday’s homework assignment asking students to find out who Peter Smart is and what he did (he is a designer who blogged about the problem solving process by solving 50 problems in 50 days). Note that this is a problem identification phase only. Students’ identified problems and issues will be vetted at a later date in the course.

**Standards**:

*Wisconsin Standards for Literacy in All Subjects:*

* RH – 1 Cite textual evidence supporting analysis of sources
* RH-2 Determine central ideas, provide accurate summaries
* RST-2 Determine central ideas, summarize information
* RST -7 Integrate and evaluate multiple sources of information
* WHST – 4 Produce clear and coherent writing appropriate to task
* WHST – 7 Conduct short research to answer a question
* SL-1 Initiate/participate in a range of collaborative discussions
* SL -2 Integrate multiple sources of information to problem solve
* SL – 4 Present information and supporting evidence clearly
* SL – 6 Adapt speech to a variety of contexts and tasks
* L-1 Demonstrate command of English when speaking and writing
* L-2 Demonstrate command of capitalization, punctuation, and spelling
* L-3 Use language and conventions when writing, speaking, reading & listening
* L-6 Acquire and accurately use general academic and domain-specific words

*Wisconsin Standards for Information and Technology Literacy:*

* ITL-KC1.a Plan and employ effective research strategies
* ITL-KC1.c Locate and curate resources from various sources
* ITL-KC2.b Build knowledge through active exploration of real-life issues
* ITL-ID1.a Find authentic problems in local and global contexts
* ITL-ID1.b Exhibit tolerance for ambiguity
* ITL—ID2.a Know and use a deliberate design process
* ITL – GC1.b Contribute constructively to project teams

*Wisconsin Common Career and Technical Core Standards*

* WCCTS-4c3.a Communicate thoughts and feeling with others
* WCCTS-CD1.b Demonstrate effective decision-making and problem solving
* WCCTS-CD4.d Develop positive relationships with others
* WCCTS-IMT1.a Choose appropriate sources of information for a given purpose
* WCCTS-IMT1.c Select relevant information necessary for making decisions
* WCCTS – LE1.b Employ teamwork skills to achieve collective goals

**Students’ Essential Question(s):**

* How can small actions have a larger impact on my community/the world?

**Learner’s “I Can Statements”**

* I can identify what types of problems are suited for this course
* I can communicate with others
* I can identify what relevant information I have to solve a problem
* I can treat others respectfully
* I can work as part of a team

**Assessment/Assessment Criteria**

*Formative:*

Observe students working respectfully with peers

Problem Identification & Clarification rubric

Finding, Brainstorming & Communicating rubric

Group Evaluation rubric

*Summative:*

Problem solving process documented as part of final project

**Materials Needed:**

Digital Projector

Internet Access

Problem solving pentagon handout (should have been disseminated earlier in the semester – post it in the classroom and/or provide students with extra copies.)

Class Challenge: Problem Detective handout – one per student

Appropriate Positive Educational Risk Taking handout – (modified with specific student feedback from Unit 1: Learner Expectation exercise) one per student

Problem Identification and Clarification Rubric – one per student

Finding, Brainstorming & Communication rubric – one per student

Group Evaluation Rubric – one per student

Sticky notes

Larger poster paper for organizing sticky notes - 1 sheet for every group of students hung far enough apart (or laid on tables) to allow groups of students to work together with minimal interference from other groups.

**Vocabulary**

Emulate – to match or go above someone else or their achievements

**What do I know about my students that will inform this lesson?**

Students will have varying degrees of problem solving skills. Some students may have difficulty discerning the types of problem solving that are appropriate for the lab and class. Make sure to circulate around the room and provide guidance and direction. Some students will have difficulty translating the information they find into suitable problems for the course. For example, students may find an intriguing competition that is only available to post-secondary students. Encourage them to “think outside the box” and have high school students enter the competition. Students could also take the competition parameters and turn it into a problem solving activity for their own project.

**How does this lesson connect with and build on previous lesson(s)?**

The previous lesson had students look for problems among family and friends. This is the most familiar arena for the students to work in. This lesson builds on the previous lesson by expanding the search for problems to a larger community/national/global setting. Encourage connections with students at a distance particularly if there are family/acquaintances that might provide those opportunities.

**How will I (the teacher) build upon this lesson in subsequent lessons?**

Subsequent lessons will focus on different aspects of the problem solving process. Eventually students will have been scaffolded through the problem solving process as they complete their problem solving projects.

**Lesson Implementation**

|  |  |  |
| --- | --- | --- |
| ***Instructor Will*** | ***Time allotted*** | ***Student Will*** |
| *Prepare for class*  This is part of a series of lessons where you will be scaffolding students as they walk through the problem solving process. It will be helpful to look at problem solving process concentrating on strategies used to identify, define and clarify problems  Brest, P., Roumani, N., & Bade, J. (2016)/ Problem solving, human-centered design, and strategic processes. *Stanford PACS.* Retrieved from [https://pacscenter.stanford.edu /publication/problem-solving-human-centered-design-and-strategic-processes/](https://pacscenter.stanford.edu/publication/problem-solving-human-centered-design-and-strategic-processes/)  University of Adelaide (2018). *Research skill development for curriculum design and assessment.* Retrieved from <https://www.adelaide.edu.au/rsd/>  Smart, P. (2013, May 27). *50 design problems in 50 days: Real empathy for innovation* [Blog post]. Retrieved from <https://www.smashingmagazine.com/2013/05/50-problems-50-days-part-1-real-empathy-innovation/>  Smart, P. (2013, May 27). *50 design problems in 50 days* [Interactive graphic]. Retrieved from <http://50problems50days.com/>  Use SuperTeacherTools ([https://www.super teachertools.us/](https://www.superteachertools.us/)) to randomly assign students to groups of 3 or 6 individuals.  Use student feedback from Unit 1: Lesson 4 – Learner Expectations to modify the Appropriate Positive Educational Risk Taking handout  Use student feedback from Unit 1: Lesson 4 – Learner Expectations to modify the *Finding, Brainstorming & Communicating* rubric. Integrate course standards where there is obvious and strong alignment. Alter your assessment strategies accordingly.  Optional: Consider recording students “passion” statements from Unit 1 – Lesson 1 and handing their cards back to them during the lesson. Be sure to get a copy of their statements in order to be able to connect with them personally and to help tailor instruction to their personal interests.  Make a poster of the Problem Solving Pentagon with the various facets listed so students can refer to the framework during the semester.  Post vocabulary words and definitions for student reference  Copy and collate handouts for students (and/or post to course management system)   * Class Challenge: Problem Detective handout * Appropriate Positive Educational Risk Taking handout * Problem Identification and Clarification Rubric * Finding, Brainstorming & Communicating Rubric * Group Evaluation Rubric   Consider rewards for all students participating in the Problem Detective challenge with an added bonus to the team that gets hired by *Smashing Magazine*. Be sure to give all participants some sort of “positive reinforcement” to encourage risk taking even if they didn’t “win” the competition. Keep the rewards small. For example: 1 small piece of candy to all and 2 to the group that would be “hired” by *Smashing Magazine* or a round of applause for all and a second round of applause for the team that is “hired” by *Smashing Magazine.* |  | Not applicable – teacher preparation |
| *Day 1 - Anticipatory set*  Good morning/afternoon everyone.  Can anyone tell me who Peter Smart is? (Award winning designer who started his design business at the age of 15)  What did he do? (He traveled 2,500 miles around Europe solving 50 problems in 50 days using design). You can find his post in the online at *Smashing Magazine* ([http://50problems 50days.com/](http://50problems50days.com/) )  Can anyone tell me about one of the problems Mr. Smart solved?  If students have difficulty answering the questions, or if a majority of students don’t have access to the Internet, take a few moments in class to introduce Peter Smart. You can show the video [https://www.youtube.com /watch?v=hUichyHMnqs](https://www.youtube.com/watch?v=hUichyHMnqs) from 0:45 – 4:52 and then visit his interactive site ([http://50problems 50days.com/](http://50problems50days.com/) ) and review several of his design problems and solutions. | 4 minutes  As an alternative:  6 minutes for the intro | Students will engage in a conversation about who Peter Smart is and what he did from the assigned homework  Students will watch video and then review several of his designs |
| *Day 1 - Introduce Activities*  Yesterday we looked for potential problems to solve among our friends and family. Over the next two days, we are going to try to emulate what Peter Smart did. Who knows what emulate means? (Take time to define the word) That is, we are going to look for as many or more potential problems in our community and world than Peter Smart was able to find. | 1 minutes | Students listen and refer to their Problem Solving Pentagon handout |
| *Day 1 -Content*  Assign students to randomly generated groups. Use SuperTeacherTools (or other) to randomly assign group membership. This provides a way for students to work with others in their class. Give students 1 minute to move to their assigned groups  Hand out collated packets to students that includes:   * Class Challenge: Problem Detective handout * Appropriate Positive Educational Risk Taking handout * Problem Identification and Clarification Rubric * Finding, Brainstorming & Communicating Rubric * Group Evaluation Rubric   We are going to use the Problem Detective: Class Challenge to address the Embark and Clarify stages of problem solving. Remember that “Embark and Clarify” is one facet the problem solving and research process. Take a look at your Problem Detective handout. We will be working on this assignment today and tomorrow.   * Take time to review the handout and the expectations * Speak to dividing up the workload * Explain to students the exact procedures for posting their brainstormed ideas and potential links and contacts to their larger poster paper.   Can anyone in summarize what the directions are for the Problem Detective assignment?  At the bottom of the first page of the Problem Detective handout you will see the grading criteria for this assignment.  During the next several days you will be working on problem solving and taking educational risks. I used feedback from Unit 1 and the Learner Expectations lesson to create a handout that reflects your ideas about taking appropriate educational risks. I incorporated your ideas into the *Finding, Brainstorming & Communicating* rubric.  Let’s take a look at those items   * Review the *Positive Educational Risk* handout * Review the *Problem Identification and Clarification* rubric * Review the *Finding, Brainstorming & Communicating* rubric   Are there any questions? Any comments?  Let’s take a look at the final Group Evaluation Rubric. You will be working in a group to complete this assignment. I will be asking all of you to evaluate your group’s effectiveness and to reflect on your own learning at the end of the unit. These are the criteria we will be using.  Note: You will need to modify and add items to reflect the student feedback from Unit1, Lesson 4 Learner Expectations. | 2 minutes  4 minutes  6 minutes  4 minutes | Students get into assigned groups.  Students look at handouts  Students follow along  Students ask clarifying questions  Students follow along  Students ask clarifying questions  Students follow along  Students ask clarifying questions |
| *Day 1 Student Practice*  Students will use the remainder of the hour to work in groups to brainstorm and post ideas as per the Problem Detective Class Challenge. | 23 -25 minutes | Students brainstorm ideas on sticky notes using the Problem Detective handout as a guide. |
| *Day 1 Clean Up*  Please take your sticky notes and put them on a pile on your desk (or however you want them organized and returned). Provide directions for storing the large group posters. Provide directions for cleaning up and organizing the room. | 2 minutes. | Students clean up |
| *Day 1 Closure*  Today we started looking for potential problems in the world around us. We will use our next class meeting to finish up the process. | 1 minute | Students listen |
| *Day 1 Reflection\**  I asked you this yesterday and would like to know your thoughts again today. How can small actions on your part have a larger impact on your community and/or the world?  Provide directions for students to leave their cards with you at the end of class  \* Review and summarize (avoid calling out individual students’ ideas publically) students’ feedback and respond with a tweet, a post to a learning information system or a comment at the beginning of the next class to indicate you have read and value learners’ reflections. Consider a positive note to students and/or parents making sure that each student in the class gets positive feedback in an equitable fashion throughout the semester. | 1 minute |  |
|  |  |  |
| *Day 2 Introduction*  Good Morning/Afternoon everyone. I want to take a few minutes to check in with you. What progress did you make with the Problem Detective Challenge?  I would like to hear what types of problems you have found so far. (Call on groups/students to find out where they are in the problem finding process).  Are any of you running into roadblocks? | 4 minutes |  |
| *Day 1 Student Practice*  Students will use the remainder of the hour to work in groups to brainstorm and post ideas as per the Problem Detective Class Challenge.  Recognize all groups for participating and determine winning group -- or if all do a good job then all are winners. A round of applause for all! | 40-42 minutes (if you hand back students first day “passion reflection” cards you will need extra time for the reflection portion of the lesson. Adjust time accordingly | Students brainstorm ideas on sticky notes using the Problem Detective handout as a guide. |
| *Day 2 Clean Up*  Please take your sticky notes and put them on a pile on your desk (or however you want them organized and returned). Provide directions for storing the large group posters. Provide directions for cleaning up and organizing the room. | 2 minutes. | Students clean up |
| *Day 2 Closure*  Over the past few days we have worked to emulate the work of Mick Ebeling and Peter Smart. Ebeling used his passion to make the impossible, possible. In helping one boy get artificial arms, he helped a whole community, and a country, create artificial limbs for victims of war. Peter Smith, a designer at the age of 15 shows us that we can find design problems in our everyday world. You have followed in their footsteps by identifying a number of problems that you could work on. Tomorrow, we will start the process of narrowing down those problems and selecting the one(s) we want to tackle. | 1 minute | Students listen |
| *Day 2 Reflection\**  During the first day of school I asked you to share what your passions were.  Optional: Hand back Unit 1 – Day 1 “passion reflection” . Students can write on the reverse side of the card.  I am going to ask you to take a minute and think about how your passions might be used with the problem you choose to work on. Is there any way to integrate your passion as you select the problem solving project to work on? Who/or what will “be your one?”  Note: You may choose whether you want students to submit their card or you may let them keep them. No submission is needed in terms of grading for this reflection. The reflection is intended to get students in the mindset for the upcoming lessons. | 1 – 3 minutes |  |

**Teacher’s Comments/Self-Assessment:** (use this space to reflect on what you would do differently, how the lesson unfolded, notes about students, and the like).

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**Lesson 8 Resources**

**Class Challenge:**

**The Problem Detective**

Congratulations! *Smashing Magazine* wants to hire you and your team to be contributors to their online magazine. You’ve made the preliminary cut. There’s just one catch! The magazine editors will only hire one team and there are several teams in the running. So, they’ve issued you a challenge:

Peter Smart (<https://www.smashingmagazine.com/2013/05/50-problems-50-days-part-1-real-empathy-innovation/>) was able to solve 50 problems in 50 days while travelling around the globe (<http://50problems50days.com/>). Prove that you can do the same by finding as many appropriate problems you might solve in your class this semester by looking in your local community and online. Use the guidelines below to help you get started:

As you look for ideas remember:

1. Get as many ideas as possible
2. Think “outside the box” – wild and crazy ideas are encouraged
3. Don’t judge the ideas (this will come later)
4. Consider modifying competition rules and requirements to fit your needs
   1. Use contest criteria without entering contests
   2. Use expired contests for inspiration
   3. Look for items that fit with existing courses in your school
   4. Consider competing against contests designed for college level

Post ideas:

1. Use the criteria on the following pages to find and generate ideas
2. Make sure you have thorough information so others may revisit the idea
3. Report one idea/sticky note – use legible writing and proper grammar/punctuation/spelling
4. Post your ideas to your group’s large poster paper

Assessment:

1. *Problem Identification& Clarification* rubric
2. Self/Teacher evaluation on the *Finding, Brainstorming & Communicating* rubric
3. Self/Peer evaluation on the *Group Evaluation Rubric*

Suggestion:

Divide work equally amongst group members so that all categories have **at least** one problem identified

|  |
| --- |
| **In the News**  Look in your local newspaper (online or in your library) and find problems that would benefit from a creative problem solving approach for a solution. Don’t be afraid to take screenshots of the articles.  Include Newspaper Access information  Name of Paper  Date of Paper  Page of article/url  Some links to consider  *Insert links to local news sources here* |
| **Workplace Observations**  Consider you and your friends work. Are there problems that might benefit from a redesign? Are there ways to improve efficiency? Are there ways that people’s lives might be easier with a redesign in the workspace or the tools used?  Consider who you might contact for further information and if possible indicate:  Problem identified  Name of person to contact about the problem  Phone  Address  Email |
| **Community Organizations**  Consider community and service organizations in your area. Do they struggle with problems that might benefit from a creative problem solving redesign? Are there ways to collaborate on projects with them? Are there ways to use creative problem solving to help them redesign tools, building spaces, or equipment in ways to help them serve others more efficiently or effectively?  Consider who you might contact for further information and if possible indicate:  Problem identified  Name of person to contact about the problem  Phone  Address  Email |
| **Around the School – Class/Teachers/Administrators/Sports**  Consider you, your peers, your teachers, administrators, custodians, cooks, athletics, transportation facilities and other areas around people and places around your school. Are there technical problems that might benefit from a creative redesign? Are there ways to improve efficiency? Are there ways that people’s lives might be easier with a redesign in the workspace or the tools used?  Consider who you might contact for further information and if possible indicate:  Problem identified  Name of person to contact about the problem  Phone  Address  Email |
| **Competitions**  Look online to find problem solving contests that you and your team might be able to solve in your lab. Use search terms such as problem solving, competitions, students, high school, and others of your own choosing. Consider adapting challenges and competitions without officially entering.  Remember to:  List the title of the competition  Provide the address/links where the competition is found  Some links to consider  *NASA Opportunities for Students -* <https://www.nasa.gov/audience/forstudents/stu-competitions-current-opps.html>  *Get Involved Engineering Activities -* <http://tryengineering.org/become-an-engineer/get-involved-engineering-activities?category%5B0%5D=31> |
| **Citizen Science**  Look online to find problem solving contests that you and your team might be able to solve in your lab. Use search terms such as problem solving, citizen science, Consider adapting what you find to your local community without committing to actual projects.  Remember to:  List the title of the project  Provide the address/links where the project is found  Some links to consider  *Citizen Science for Environmental Protection -*  <https://www.epa.gov/citizen-science>  *Wildlife and Forestry Research: Citizen Monitoring -* <https://dnr.wi.gov/topic/wildlifehabitat/research/citizenmonitoring.html> |

**Appropriate Positive Educational Risk Taking**

***Note: This sheet needs to be adapted as per student feedback from the Unit 1 – Learner Expectations Lesson – this communicates results of that activity back to the students. When there is a good fit, integrate course standards (i.e. WCCTS IMT3.a –adopt new technology tools) with student feedback. (Delete this paragraph after modifications have been made)***

The following examples and measure of positive educational risk taking are taken from class discussion and feedback. Here are guidelines to be used during this semester for your demonstration of educational risk taking.

**Examples of Positive Educational Risk Taking:**

* Answer/ask questions
* Provide peer feedback
* Collaborate/Interact with peers
* Reflect on performance and set goals
* Talk to others you don’t normally interact with
* Highlight a failure and what you learned from it
* Compliment peers
* Use ideas from student input in Unit 1 lesson – Student Expectations

**Demonstrating Positive Educational Risk Taking:**

* Post to a paragraph setting goals. Return later to reflect on how they were met
* Log interactions with others and reflect on how that pattern changed over time
* Use ideas from student input in Unit 1 lesson – Student Expectations

# Name:

# Problem Identification & Clarification Rubric ( - Embark & Clarify)

Adapted from: Custer, R., Valesey, B., Burke, B. (2001). An assessment model for a design approach to technological problem solving. *Journal of Technology Education, 12*(2). doi <https://doi.org/10.21061/jte.v12i2.a.1P> Permission for use obtained from Dr. R. Custer 22 July, 2018 ([Rodney.Custer@bhsu.edu](mailto:Rodney.Custer@bhsu.edu))

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Novice** | **Beginner** | **Competent** | **Proficient** | **Expert** |
| **Embark & Clarify** | Exhibits considerable indifference or frustration. Doesn’t see context.  Does not ask questions to and would begin the problem solving process without clarification or questions.  Tends to hone in on wrong problem, isolated subset, or easiest part to solve. | Exhibits some indifference or frustration. Ignores context.  Asks questions but not pertinent and too few to start the problem solving process.  . | Defines problem adequately. Ignores context.  Poses a few pertinent questions that one might need for clarification as they start the problem solving process.  Identifies key content. | Expresses limited knowledge of context or problem. Problem is defined but needs clarification. Ignores context.  Poses some pertinent questions that would help start the problem solving process.  Identifies sub-problems but does not prioritize. | Accurately describes current state of affairs supported by stories, data or other supporting information that demonstrates understanding/ empathy.  Poses pertinent questions that one needs to ask for clarification in order to solve problem.  Identifies and prioritizes sub-problems (within the larger problem). |

**Comments:**

**Finding, Brainstorming & Communicating Rubric (Unit 2:**  **- Embark & Clarify)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Novice** | **Beginner** | **Competent** | **Proficient** | **Expert** |
| **Finding Problems** | My actions are totally teacher directed. I explore problems by following the teacher’s directions in a step-by-step process. I make little effort to search on my own. Educational risk taking and effort is minimal. | I am self-directed at least 50% of the time. I explore problems that take a minimal amount of searching or I search in familiar places taking minimal risks. Some effort made to expand educational risk taking. | I am self-directed at least 65% of the time. I deduce problems from a couple of sources. I make sure to get teacher approval each time I move forward. I am willing to take some educational risk. | I am self-directed at least 80% of the time. I am able to deduce several problems from multiple sources. I request minimal help moving forward. I am willing to try to expand my educational risk taking with teacher support. | I am self-directed more than 85% of the time. I deduce problems by being observant of news sources, readings, media sources, my school and community. I talk to others to find problem-solving opportunities. |
| **Brainstorming** | Brainstorm less than 5 (total) ideas in the Problem Detective Challenge.  Information is missing making it difficult or impossible for others to revisit the idea. | Brainstorm **a minimum of** 5 (total) ideas in one category of the Problem Detective Challenge.  Some information is missing making it a challenge for others to revisit the idea. | Brainstorm **a minimum of**  6 (total) ideas in one category of the Problem Detective Challenge.  Thorough information is included, allowing others to revisit the idea. | Brainstorm **a minimum of** 9 ideas (total) in two or more categories of the Problem Detective Challenge.  Thorough information is included, allowing others to revisit the idea. | Brainstorm **a minimum** of 12 ideas (total) in three or more categories of the Problem Detective Challenge.  Thorough information is included, allowing others to revisit the idea. |
| **Communication**  **Skills** | I have difficulty stating my ideas and connecting to assignment criteria. It is difficult for me to imagine what information my target audience needs or wants. I make an attempt but it lacks focus and clarity.  Numerous errors in grammar, spelling, or punctuation are found. Bullet points and minimal responses are used to convey information  Information is missing | I state my ideas with help from peers and teachers. My ideas and presentations use cookie-cutter templates with little/no attempt to customize elements.  My work addresses some of the assigned criteria but I am unclear who my target audience is or how I might tailor my message to my target audience  Some errors in grammar, spelling, or punctuation are found. Bullet points and minimal responses are used to convey information | I can state my ideas but they lack focus or direction. My ideas and presentations are taken directly from templates with little attempt to add unique or creative elements.  My work addresses many of the assigned criteria and considers a target audience that is not clearly defined.  Minimal errors in grammar, spelling, or punctuation are found. Full sentences - where appropriate – are used to convey information | I can clearly and succinctly state my ideas either professionally OR uniquely. My work addresses most of the assigned criteria and/or a defined target audience.  Proper grammar, spelling, punctuation and full sentences - where appropriate – are used to convey information | I can clearly and succinctly state my ideas both professionally AND uniquely. My work clearly addresses assignment criteria and/or a clearly defined target audience.  Proper grammar, spelling, punctuation and full sentences - where appropriate – are used to convey information |

**Comments:**

# Group Evaluation Rubric

**Name:**

Custer, R., Valesey, B., Burke, B. (2001). An assessment model for a design approach to technological problem solving. *Journal of Technology Education, 12*(2). doi <https://doi.org/10.21061/jte.v12i2.a.1> Permission for use obtained from Dr. R. Custer 22 July, 2018 ([Rodney.Custer@bhsu.edu](mailto:Rodney.Custer@bhsu.edu))

|  |  |
| --- | --- |
| All members of the group contributed actively to the process | 5 4 3 2 1 |
| The members achieved an appropriate balance between leadership and followership | 5 4 3 2 1 |
| All members contributed creative ideas to the process | 5 4 3 2 1 |
| The group was able to re-energize when the energy level dropped off | 5 4 3 2 1 |
| The group was able to critique its own work | 5 4 3 2 1 |
| There was a good balance between group and individual work | 5 4 3 2 1 |
| As a whole, the group was flexible and adaptable | 5 4 3 2 1 |
| The group generated many new ideas rather than prematurely selecting a single solution | 5 4 3 2 1 |
| The group was able to incorporate diverse personalities and ideas | 5 4 3 2 1 |
| The group had the ability to resolve adversity (ideas that didn’t work, frustration, etc.) | 5 4 3 2 1 |

# 5 – Absolutely true of this group

**4 – Described the group for the most part**

**3 – Description fit the group about half of the time**

**2 – Only marginally describes the group**

**1 – Does not describe the group at all**

|  |
| --- |
| **CATEGORIZING AND NARROWING OPTIONS** |
| **Lesson Plan #9** |
| **Unit 2:** Embark & Clarify |

|  |  |
| --- | --- |
| **Grade Level:** 10 -12 | **Instructor:** Sylvia Tiala |
| **Time Allotted:** 1- 50 minute period | **Address:** [tialasyl@gmail.com](mailto:tialasyl@gmail.com)  N4551 446th Street, Menomonie, WI |
| **School District/Organization:**  **C:\Users\Sylvia\Pictures\Sylvia Fold Logo.jpg** | **Date:** June 25, 2018 |
| **Adaptations & Acknowledgments:**  This lesson was adapted from Aerospace as well as Engineering & Virtual Problem Solving courses previously taught at Boone High School in Boone, Iowa. | |
| [Creative Commons License](http://creativecommons.org/licenses/by-nc/4.0/)**Creative Commons License Attribution:**  Problem Solving Curriculum Guide: A Process - Based Approach for Secondary Schools by Sylvia Tiala is licensed under a [Creative Commons Attribution-NonCommercial 4.0 International License](http://creativecommons.org/licenses/by-nc/4.0/) | |

**Brief Description:**

It is time for students to start selecting their projects. The first part of the lesson asks each group of students to categorize their brainstormed ideas for problems to solve into Personal, News, Workplace, Community Organizations, School, Competitions, and Citizen Science categories. Individual students select 4 potential problems from the list of generated ideas before moving on to reflect on the strengths they bring to their selected problems.

**Standards**:

*Wisconsin Standards for Literacy in All Subjects:*

* WHST – 4 Produce clear and coherent writing appropriate to task
* WHST – 6 Use technology to produce individual writing
* SL – 4 Present information and supporting evidence clearly
* L-1 Demonstrate command of English when speaking and writing
* L-2 Demonstrate command of capitalization, punctuation, and spelling
* L-3 Use language and conventions when writing, speaking, reading & listening
* L-6 Acquire and accurately use general academic and domain-specific words

*Wisconsin Standards for Information and Technology Literacy:*

* ITL-KC2.a Produce creative artifacts for multiple audiences
* ITL – CC1.c Utilize digital tools to communicate ideas to an authentic audience
* ITL-GC1.c Select and leverage appropriate digital tools to exchange ideas

*Wisconsin Common Career and Technical Core Standards*

* WCCTS-4c3.a Communicate thoughts and feeling with others
* WCCTS-CD1.a Identify personal strengths, aptitudes and passions
* WCCCTS-CD2.b Assess attributes and skills that contribute across the life span
* WCCTS-CD4.b Demonstrate skills related to job seeking and application
* WCCTS-IMT2.b Prepare media products to communicate a specific lesson

**Students’ Essential Question(s):**

* How can I best prepare myself to follow my career choice?

**Learner’s “I Can Statements”**

* I can employ effective research strategies
* I can identify personal strengths and aptitudes
* I am able to use digital tools to create graphics that communicate information

**Assessment/Assessment Criteria**

*Formative:*

Qualifications Word Cloud

Problem Identification & Clarification rubric

Finding, Brainstorming & Communicating rubric

*Summative:*

Problem solving process documented as part of final project

**Materials Needed:**

Digital projector

Internet access and devices to connect

Large Poster paper with category titles listed: Personal, News, Workplace, Community Organizations, School, Competitions, and Citizen Science

*Narrowing Options* handout – one for each student

*Qualifications Summary - Word Cloud* handout - one for each student

**Vocabulary**

*Resume* – a summary of your personal, educational, and professional experiences

*Word Cloud –* an image made of words that describe importance of words in written documents

**What do I know about my students that will inform this lesson?**

Problem solving comfort levels will differ among students. Some will choose projects that align with passions and interests, some students will pick projects that they may already have explored. Some students will pick projects that they can work on with friends. It is important for the course instructor to tie into students’ strengths, interests, and passions while still expecting and encouraging student growth.

Students’ employment experience will vary. Some may have jobs and can relate to employability skills. Others students who have not had any working experience may have a difficult time translating the school experience into employability and problem-solving skills. It will be important to help students identify and list transferable problem solving and employability skills.

**How does this lesson connect with and build on previous lesson(s)?**

This lesson continues scaffolding students through the problem solving process.

**How will I (the teacher) build upon this lesson in subsequent lessons?**

During this lesson students narrow project selection to several ideas that they will choose from for the final project. The selected lessons will be analyzed using the Pugh method in upcoming activities. A self-analysis of students’ own competencies will prepare them for selecting team mates in future assignments.

**Lesson Implementation**

|  |  |  |
| --- | --- | --- |
| ***Instructor Will*** | ***Time allotted*** | ***Student Will*** |
| *Prepare for class*  Arrange room to facilitate interaction  Review: *How to create your resume (*[*https://doublem coaching.com/dmcblog/2018/2/24/how-to-create-your-resume-word-cloud*](https://doublemcoaching.com/dmcblog/2018/2/24/how-to-create-your-resume-word-cloud) *)* and similar sites. Familiarize yourself with creating a word cloud from a typed document.  Davies, J. (n.d.). *Word cloud generator.* Retrieved from [https://www.jasondavies.com /wordcloud/](https://www.jasondavies.com/wordcloud/)  Feinberg, J. (2014). Wordle. Retrieved from <http://www.wordle.net/>  Zygomatic (n.d.) WordClouds.com. Retrieved from [https://www .wordclouds.com/](https://www.wordclouds.com/)  Review Mark Slack’s *How to write a qualifications summary* at <https://resumegenius.com/how-to-write-a-resume/qualifications-summary-writing-guide> . Pay particular attention to the Infographic and Summary Examples  Review terms and conditions of using ResumeGenius templates that are referenced in assignments. Make sure that policy, procedures and permissions are in place for student use.  Prepare Large Poster Paper with titles for each of the following categories:   * Personal * News * Workplace * Community Organizations * School * Competitions * Citizen Science   Post vocabulary words and definitions  Copy/post the *Narrowing Options* chart (note that the chart is printed on 1 sheet of paper with the same form front & back)  Copy/post a Qualifications Summary - Word Cloud assignment for each student. Ideally this assignment will be posted so that students can type directly into the document. It will save them time when they create their word cloud.  Find examples of resumes and word clouds to show students. Have them ready for class presentation  Post Unit 2: Items to Consider for Demonstrating Growth for students to access and consider as an option to demonstrate growth. Tie to their feedback if possible. | Approximately 60 minutes will be needed to review resources, to modify examples, post items to servers, and the like |  |
| *Anticipatory set*  Good morning/afternoon everyone!  Let’s start with a couple of questions. Who in here thinks they have found the problem they want to work on for the rest of the semester?  (Call on students who raise their hand and ask what the problem is and why they chose it. Adjust responses as appropriate).  Who in here has all of the skills necessary to complete a project? (Call on students who raise their hand. Ask what those skills are and why they believe they have all of the necessary skills. If there is a person who has a problem identified and has all the necessary skills, consider asking how they will demonstrate learning growth or appropriate educational risk taking if this is the case). Adjust responses as appropriate | 3 minutes | Students will either respond to the teacher’s response or they will not answer. |
| *Introduce Activities*  We have spent the last 3 days looking for viable problems that are options for us this semester. Today we will narrow the options to match your interests.  Please know that in most, if not all, cases people don’t have the answers or all of the information or skills that they need to solve problems. This is fine. If everyone had the information, skills and materials needed to solve a problem then there may not be a problem. | 1 minute | Students listen |
| *Content*  Let’s start by taking a look at all of the options that you have brainstormed over the past few days. Look around the room at the topic posters. You will see a poster for every category you explored: Personal, News, Workplace, Community Organizations, School, Competitions, and Citizen Science.  Will each person in your group take all of your ideas for the personal and family ideas and post them to the “Family” poster. Will one person from your group take all of the problems found in newspapers and post them to the “News” poster. You get the idea (make sure the students get the idea and/or specifically go through the list).  I will give you 3 minutes to get this done. Please start now.  Note: Hand out the “Narrowing Options” sheet to students’ desks while the students are categorizing their items on the larger poster paper.  Now that the ideas are posted I would like all of you to take 4 minutes to walk around and look at all of the ideas. Get a sense of those problems you might be interested in working on. Note: Provide directions so that students start at different places in the room.  Take a look at all of the ideas you have generated. Give yourselves a round of applause for a job well done (provide positive recognition for effort and encourage students).  Take a look at your desks and you will notice that I have laid a “Narrowing Options” sheet on your desk. Please go back to the posted problems in the room. Use the “Narrowing Options” sheet to identify the top 4 problems that you are interested in working on. Be sure to copy the relevant information onto the sheet. You may use your phone to take a picture of the posted problem for your convenience and documentation (provide instructions as course and school policy allow). | 1 minute  3 minutes  4 minutes  30 seconds | Students listen  Students post brainstormed ideas.  Students walk around room and look at the ideas |
| *Student Practice*  You have 10 minutes to complete this assignment. Note: indicate you will provide more time for assignment completion if you will allow this option.  Note: You may need to leave the posters up so students can access them after school/before school or during the day. Plan on allowing extra time for access. Consider taking pictures of the posters and posting them to a course management system where students can access them. | 10 minutes | Students take 10 minutes to start/complete the assignment. |
| *Introduce Activities*  We’re starting to refine our project ideas but we need to consider if we have the resources to be successful. Let’s start with ourselves. What skills, attitudes, and work habits can you contribute to a project? It is likely that you have some, but perhaps not all, of the skills, attitudes and work habits to complete the project. We need to find others to help.  We are going to create a qualifications summary - a list of our accomplishments and use it to generate a word cloud that represents our strengths.  Does anyone know what a word cloud is? (Ask for ideas and then clarify. Refer to the posted vocabulary words. Consider showing an example).  We will share our “qualifications” word clouds in a couple of days as we select projects and partners. | 1 minute & 30 seconds | Students may/may not answer question depending on their familiarity with word clouds |
| *Content*  Note: Provide students with a link to the <https://resumegenius.com/how-to-write-a-resume/qualifications-summary-writing-guide> (or similar) website. Direct them to log on or to follow along as you access the website. Scroll to the infographic section. As an alternative you can link directly to the infographic at: <https://resumegenius.com/wp-content/uploads/2014/06/Qualifications-Summary-Infographic.jpg> . Consider making a copy of the infographic for your students and/or posting a link to the infographic in your course management system  Note: Hand out/direct students to log into the *Qualifications Summary - Word Cloud* worksheet. It will be best if you do this electronically so that students can type in their answers. Then they are able to copy and paste responses to a word cloud site without having to retype the information.  I want you to sum take the next few minutes and think about your qualifications. What do bring to the table? Mark Slack from ResumeGenious has provided some help (log onto <https://resumegenius.com/how-to-write-a-resume/qualifications-summary-writing-guide>).  Notice that Slack looks a qualifications like a gemstone. Remember, all gemstones are unique as are you. We’ll get started by creating a picture of that gemstone that captures your current qualifications.  Authority describes the major skills you have. What major skills do you have? Take 2 minutes to list some you major skills. Consider academic skills you have learned (math, science, English). Skills you have learned as part of a hobby  What creative projects are you working on or have you completed? This could include creative projects you have completed here in school or at home. Please list these on your worksheet.  Repeat directions with brief descriptions for students for the categories. Try to provide examples that are relevant to students (dealing with irate customers while working at a fast food restaurant is an example of management):  Efficiency – Examples of how you met deadlines  Recognition – major awards and honors  Management – examples of managing people, projects, or time  Communication – interacting with customers, public speaking  Note: Wander the room and help students as needed while keeping the pace of the activity going. | 1 minute  1 minute  2 minutes  1.5 minutes  1.5 minutes  1.5 minutes  1.5 minutes  1.5 minutes  1.5 minutes | Student refer to posted resources, their Qualifications Summary – Word Cloud worksheet as directed by the instructor.  Students list authority-related skills  Students list creative- related skills  Students list efficiency-related evidence  Students list major awards and honors  Students list management examples  Students list communication examples |
| *Student Practice*  Next we’ll take your list of qualifications and turn them into a qualifications summary and then a word cloud.  Use the items on your list to create at least 3 bullet point that describe your qualifications. Start each of your bullet points with an action verb.  Note: wander the room and provide help.  Creating a word cloud is now very simple. Log on to Wordcloud [https://doublemcoaching .com/dmcblog/2018/2/24/how-to-create-your-resume-word-cloud](https://doublemcoaching.com/dmcblog/2018/2/24/how-to-create-your-resume-word-cloud). Select one of the listed word cloud generators. Copy and paste your profile bullet points into the word cloud. Take a screenshot of your word cloud and save it (provide directions for saving and submitting an image file, printing, or other) | 5 minutes  3 minutes | Students create bullet points  Students create word cloud |
| *Clean Up*  Provide directions for cleaning up not limited to logging off of servers, picking up handouts, and the like. | 1 minute | Student clean up |
| *Closure*  We started today by narrowing your problem selection and ended the hour by creating a graphical word cloud that summarizes your problem solving qualifications. We will use your world cloud later in the week.  This assignment was done intentionally to start you thinking about your current skills and how they might transfer to real-world experiences. The problem solving skills you develop here are highly sought after by today’s employers. If you look at your current skill level and think about what job or career you see for yourself, you can use the type of activities we did today to intentionally and purposefully add to your existing qualifications, and thus your employability.  Your qualification summary is a good start but you need to create a resume when you start a job search. Does anyone know what a resume is? Ask for ideas and then clarify.  Note: Refer to posted vocabulary words. Consider showing an example of a resume.  Provide access to the Unit 2: Items to Consider for Demonstrating Growth posting/handout. Briefly review the options and indicate that you are willing to provide assistance, or direct them to others who can help if needed. Tie the posted items to the students ideas for demonstrating growth if possible. | 1 minute  2 minutes |  |
| *Reflection:*  As you leave today, I will ask you to consider two questions. They are:   1. What takeaways from today’s lesson will be important to you three years from now? 2. How can I best prepare myself to follow my career choice?   Note: Collecting responses is not required. Students taking this reflection seriously may choose to complete one of the Demonstrating Growth Activities from Unit 2. | 1 minute |  |

**Teacher’s Comments/Self-Assessment:** (use this space to reflect on what you would do differently, how the lesson unfolded, notes about students, and the like).

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genius.com/how-to-write-a-resume/qualifications-summary-writing-guide](https://resumegenius.com/how-to-write-a-resume/qualifications-summary-writing-guide)

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**Lesson 9 Resources**

**Narrowing Options Card**

It is time for you to consider which problem you want to work on for the rest of the semester. This exercise will help you narrow your options. Review the list of problems you and your classmates have identified. Select the top 4 problems that interest you the most. Use the chart below and on the back of this page to describe the problems you have selected for further investigation.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Problem Description |  |  | Problem Description |  |
| Contact Name |  |  | Contact Name |  |
| Contact Address |  |  | Contact Address |  |
| Phone |  |  | Phone |  |
| Email |  |  | Email |  |
| Other (date, page number, url) |  |  | Other (date, page number, url) |  |
| Questions I would ask for clarity |  |  | Questions I would ask for clarity |  |

**Narrowing Options Card**

It is time for you to consider which problem you want to work on for the rest of the semester. This exercise will help you narrow your options. Review the list of problems you and your classmates have identified. Select the top 4 problems that interest you the most. Use the chart below and on the back of this page to describe the problems you have selected for further investigation.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Problem Description |  |  | Problem Description |  |
| Contact Name |  |  | Contact Name |  |
| Contact Address |  |  | Contact Address |  |
| Phone |  |  | Phone |  |
| Email |  |  | Email |  |
| Other (date, page number, url) |  |  | Other (date, page number, url) |  |
| Questions I would ask for clarity |  |  | Questions I would ask for clarity |  |

**Qualifications Summary - Word Cloud**

**Adapted from:**

Slack, M. (n.d.) *How to write a qualifications summary.* Retrieved from [https://resume  
genius.com/how-to-write-a-resume/qualifications-summary-writing-guide](https://resumegenius.com/how-to-write-a-resume/qualifications-summary-writing-guide)

Wordcloud <https://doublemcoaching.com/dmcblog/2018/2/24/how-to-create-your-resume-word-cloud>

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Use the categories below to create a personal profile that best describes your problem solving qualifications. Be sure to give yourself credit for past experience. By the end of the exercise you should have **at least** 3 items listed. For example, waiting on customers in a fast-food establishment provides evidence that you can communicate clearly. If you have successfully dealt with irate customers then you have experience managing conflict with other people. Refer to Slack’s infographic (see link above) or follow along with your instructor as your review Slack’s posting.

**Problem Solving Qualifications:**

Authority – What major skills do you have?

Creativity – Projects you have completed or are working on:

Efficiency – Examples of how you met deadlines

Recognition – major awards and honors

Management – examples of managing people, projects, or time

Communication – interacting with customers, public speaking

**Create Your Profile:**

Use the notes you wrote to create a list of **at least** three bullet points that start with an action verb (organized, earned, completed, made, met, designed, repaired, programmed, etc.)

* -
* -
* -
* -
* -
* -

**Create Your Word Cloud**

Log on to Wordcloud <https://doublemcoaching.com/dmcblog/2018/2/24/how-to-create-your-resume-word-cloud>. Select one of the listed word cloud generators. Copy and paste your profile bullet points into the word cloud. Take a screenshot of your word cloud and save it as per your teacher’s directions

**References to help you:**

LiveCareer (2018). 3 dos & don’ts for your summary of qualifications. Retrieved from <https://www.livecareer.com/career/advice/resume/3-dos-donts-for-your-summary-of-qualifications>

Live Career (2018). *Create my resume.* Retrieved from <https://www.livecareer.com/build-resume>

Wordcloud <https://doublemcoaching.com/dmcblog/2018/2/24/how-to-create-your-resume-word-cloud>

**Unit 2: Items to Consider for Demonstrating Growth**

Note: Please tweak the assignments and post to a course management system and/or hand out to students as your course/school allow

You have been asked to show academic risk taking, educational growth and digital/information literacy skills. Consider one or more of the following options to meet these goals:

1. Qualification Summary – Then and Now: Complete the Qualifications summary as described in Unit 2. Repeat the activity near the end of the semester. Compare and contrast your summaries from the beginning of the semester with the end of the semester. Reflect on how your word cloud demonstrates growth and purposeful action at building transferable skill suitable for real-world careers.
2. Create Your Resume: Log on to <https://www.livecareer.com/build-resume> or a similar site (or use a word processor on your own) to create your resume. When you have finished save and review your resume. Identify 2 ways you want to build your competency level by the end of the semester. Describe how you will do this. At the end of the semester update and save a new copy of your resume. Reflect on if/how you met your goals and how your resume changed over time. Describe strategies you will use to continue building your competencies.
3. Career Planning Project: Log on to the Career Planning Project at <https://sites.google.com/a/cypanthers.org/career-planning-project/home>. Review the steps in the side panel including the Essential questions, the challenge, the guiding activities, resources, and the link. Follow the challenge directions to create and present your digital portfolio by the end of the semester.
4. Work Skill Development Framework: at <https://www.adelaide.edu.au/rsd/framework/frameworks/WSD-2009_2014.pdf>. Download and review the Work Skill Development Framework. Take time to review the Facets of Work Skill in the left column. Note that the skills listed here can apply to both the work place and to educational environments. The next step is to look at the table cells to the right of work skill facets and the level of autonomy (that is how much self direction) is needed. The Level 1 column describes a person who needs a lot of structure and guidance from managers or teachers. Level 5 describes a person who needs little direction. Use the chart to circle the cells that best describe your level of autonomy in a work and/or school setting. Make a second copy of the framework and give it to your boss or teacher. Have your boss/teacher circle the cells that they think bests describes your level of autonomy. Schedule a time to discuss the results with your boss/teacher. Reflect on similarities or differences. You may choose to repeat this at the beginning and end of the semester to show growth.

|  |
| --- |
| **DECISION MATRIX** |
| **Lesson Plan #10** |
| **Unit 2:** Embark & Clarify |

|  |  |
| --- | --- |
| **Grade Level:** 10 -12 | **Instructor:** Sylvia Tiala |
| **Time Allotted:** 2- 50 minute periods | **Address:** [tialasyl@gmail.com](mailto:tialasyl@gmail.com)  N4551 446th Street, Menomonie, WI |
| **School District/Organization:**  **C:\Users\Sylvia\Pictures\Sylvia Fold Logo.jpg** | **Date:** June 25, 2018 |
| **Adaptations & Acknowledgments:**  This lesson was adapted from Aerospace as well as Engineering & Virtual Problem Solving courses previously taught at Boone High School in Boone, Iowa. | |
| [Creative Commons License](http://creativecommons.org/licenses/by-nc/4.0/)**Creative Commons License Attribution:**  Problem Solving Curriculum Guide: A Process - Based Approach for Secondary Schools by Sylvia Tiala is licensed under a [Creative Commons Attribution-NonCommercial 4.0 International License](http://creativecommons.org/licenses/by-nc/4.0/) | |

**Brief Description:**

Students will evaluate their project selection and narrow down project options using the Pugh method and a decision matrix analysis. They will use this information along with their Qualifications Summary word cloud to choose projects and teams they will work with for the rest of the semester.

**Standards**:

*Wisconsin Standards for Literacy in All Subjects:*

* RST-3 Follow complex multistep procedures
* RST-4 Determine meaning of symbols in domain-specific contexts
* RST-5 Analyze how information is categorized and structured
* SL -5 Make strategic use of digital media

*Wisconsin Standards for Information and Technology Literacy:*

* ITL-EL1.d Utilize feedback using digital tools. Analyze data to justify outcomes
* ITL-EL2.d Understand and apply functions and operations
* ITL-ID2.a Know and use a deliberate design process
* ITL-ID2.b Select and use digital resources to plan and manage a design process
* ITL-CC1.c Utilize digital tools to analyze and communicate complex ideas

*Wisconsin Common Career and Technical Core Standards*

* WCCTS-IMT1.b Determine the relevance of data and information
* WCCTS-IMT1.c Select relevant information for making decisions

**Students’ Essential Question(s):**

* What underlying mathematical patterns did I use in my decision making tool?

**Learner’s “I Can Statements”**

* I can create a decision matrix to inform the problem solving process

**Assessment/Assessment Criteria**

*Formative:*

Ability to create and use a decision matrix

*Summative:*

Problem solving process documented as part of final project

**Materials Needed:**

Digital projector

Computer with Excel or spreadsheet capabilities

Decision Matrix Analysis Script

**Vocabulary**

*Matrix* – a rectangular collection of information in (we will use numbers) rows and columns that is changed or manipulated using a set of rules (we will multiply and add numbers).

**What do I know about my students that will inform this lesson?**

Mathematical abilities will vary in the classroom. It is uncertain how many students will be familiar with embedding mathematical formulas into spreadsheets. Make sure to have strategies (posting instructional videos, having students who finish early help other, post a template online for students who struggle) to help all of the students in the course succeed.

**How does this lesson connect with and build on previous lesson(s)?**

The decision matrix developed during this lesson helps students decide which of the many project proposals may be viable for them to work on. The lesson relies on students having completed the brainstorming and project selection activities during the previous 3- 4 days.

**How will I (the teacher) build upon this lesson in subsequent lessons?**

Students will use the information from this assignment to choose groups they will work with and projects that they will focus on during the remainder of the semester.

**Lesson Implementation**

|  |  |  |
| --- | --- | --- |
| ***Instructor Will*** | ***Time allotted*** | ***Student Will*** |
| *Prepare for class*  Review Decision Matrix website and video [https://www.mindtools .com/pages/article/newTED\_03.htm](https://www.mindtools.com/pages/article/newTED_03.htm)  Review the Decision Making Matrix Script. Modify it as needed for your particular setting.  Arrange room to facilitate instruction in using spreadsheets  Post vocabulary words and definitions | 30 minutes for prep time to review video and update script excluding developing knowledge of spreadsheets | Not applicable – teacher preparation |
| *Anticipatory set*  How many of you in here know what project you want to work on for the rest of the semester?  Depending or responses:  How did you make your decision?  OR  Would you like to learn a strategy to help you make a decision? | 1 minute | Students answer question |
| *Introduce Activities*  Today we are going to look at one way you can decide which of the projects is may be best for you.  We are going to look at a decision matrix. Who knows what a matrix is.  (Expect some responses referencing the movie)    Refer to vocabulary word on the board and define it for students.  Start referencing the video script in the lesson resources at this point. | 43 minutes | Students create decision matrix as they follow along with your example |
| *Content*  See video script | Included in the 43 minutes | Students work on their decision matrix |
| *Student Practice*  See video script  Students will be ranking their items as part of the scripted activities  Note: if students get done early they may return to their word cloud activity and finish that.  If all students are caught up with all of the activities then start having them identify and select the projects they want to work on and the groups they want to work with. | Included in the 43 minutes | Students work on their decision matrix  and if finished they will work on their word cloud from the previous day |
| *Clean Up*  Instruct students to save their work as appropriate to your setting | 2 minutes | Student clean up |
| *Closure*  Yesterday you worked on a word cloud that captured a description of your expertise.  Today we worked on a decision matrix to help you decide which projects have a good chance of succeeding.  Tomorrow we will use both your expertise word cloud and your decision matrix to choose projects and teams.  You will have the first 30 minutes of the hour tomorrow to finish up your word cloud and your decision matrix. We will assess your progress during the second part of the hour tomorrow. | 1 minute | Students listen |
| *Reflection:*  What are the underlying mathematical patterns that you used in today’s decision matrix?  Note: Get students to reflect on the idea that you can change verbal words into mathematical equations.  Get students to see the pattern of criteria item multiplied by the weighted factor. | 4 minutes | Students engage in the conversation |

**Teacher’s Comments/Self-Assessment:** (use this space to reflect on what you would do differently, how the lesson unfolded, notes about students, and the like).

**References**

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.youtube.com/watch?time\_continue=11&v=xO7xJ1sTyPI](https://www.youtube.com/watch?time_continue=11&v=xO7xJ1sTyPI)

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.youtube.com/watch?time\_continue=11&v=xO7xJ1sTyPI](https://www.youtube.com/watch?time_continue=11&v=xO7xJ1sTyPI)

**Lesson 10 Resources**

**Decision Matrix Analysis Script**

**Adapted from:** MindTools (n.d.). *Decision matrix analysis: Making a decision by weighing up different factors.* Retrieved from <https://www.youtube.com/watch?time_continue=11&v=xO7xJ1sTyPI>

Suggestion: play the listed video and pause it to set up your spreadsheet at critical points during the video. The script (below) is designed to interact with the Decision matrix analysis video from MindTools that is listed above.

|  |  |  |
| --- | --- | --- |
| **Script** |  | **Visual** |
| All of you have picked out 4 projects that you are interested in working on for the rest of the semester. I did not ask you to consider how difficult any of these were to complete. Today we are going to use a method called the Pugh method, named Stuart Pugh who was a design engineer.  We will be creating a chart that looks similar to the one on the right to make decisions. | 1 minute | [https://upload.wikimedia.org/wikipedia /commons/6/69/Pugh\_excel\_sheet.png](https://upload.wikimedia.org/wikipedia/commons/6/69/Pugh_excel_sheet.png) |
| Please log on to the server and open up a copy of Excel or Google Sheets. (Provide directions for your situation. Leave time for students to access the spreadsheet. Walk through these directions as students work at their desks/stations. | 3 minutes |  |
| Enter you name in cell 1-A  There is a video that will walk us through the steps that we need to use to make a Pugh Chart. Let’s take a look:  Play video from 0:00 – 0:30 then pause |  |  |
| Yesterday you chose 4 projects that you were interested in working on. You can either number your ideas or give them a name. Please take a moment to do that.  When you are done list :  Option 1 in cell 4-A  Option 2 in cell 5-A  Option 3 in cell 6-A  Option 4 in cell 7-A |  |  |
| Play video 0:30 – 0:42  Now we need think about what we will need to complete our selected projects. We need to label our ideas in the columns. I know that one important factor to consider is time. We only have 1 semester to get our project identified and completed. What else do we need to  think about?  Give students time to respond |  |  |
| Lead them through discussing the major items the will need to consider such as:  Cost  Tools  Materials  Their own expertise (tie in their Qualifications summary from the previous day)  Internet access  Community experts |  |  |
| Play video 0:42 – 1:05  Now we need to determine how important each of these items are. Type the word “Importance” in cell A-3.  Next you need to determine how important each of the items are. If the are all the same importance you will enter a 1. If you don’t have much money and the cost is 3 times as important then you will enter a 3. Keep your numbers reasonable – say between 1 and 5. I don’t have internet access at home so that is really important for me (provide examples for students). I have entered my ideas here (or walk students through this so they all have the same numbers). You need to determine importance levels for yourself. |  |  |
| The video tells us to rate items but first we need a rating scale. We should all use the same rating scale so let’s write that into our spreadsheet.  Type the word “Score” into cell 11-B  Under that we will set our scale. Type the following into the cells  12-B Poor  13-B Bad  14-B Fair  15-B Good  16-B Excellent |  |  |
| Next we will assign or rating values for each of the options. We want an item that costs a lot or will take a lot of time to be rated lower than something that is quick, cheap and easy to make. If we need the internet to get our project done but don’t have access then it scores lower than if the project doesn’t need the Internet. (Provide examples and explanations).  We will complete our rating scale by typing the following numbers in these cells:  1= 12-C  2 = 13-C  3 = 14-C  4 = 15-C  5 = 16-C |  |  |
| OK, We have our options and we have our importance ranking and we have our rating scale. Play the video 1:05 – 1:33. We have the option of following the video or automating our spreadsheet so it will calculate totals for us. First we will make column I (or whichever) wide enough to hold a math formula. (show how to make the column wider by dragging on it.  Next we will label our column I-2 Total. This column will show our total score. |  |  |
| Now what we want to do is have our spread sheet calculate totals for us. We want to be able to enter a score – let’s say 2 for option 1 and time (B-4). We see that option 1 has an importance level of 1 so the total scores should be 1. Let’s say the cost of option 1 is really low and it will be easy to make. We will give the cost option of item 1 (C-4) a score of 4. But wait, it has a multiplying factor so the score should really be 12. Hang on, we will get to that in a moment. Let’s continue rating project choice 1 on our spreadsheet. For practice enter the following ratings.  Tools for option 1 (D-4) at 3  Materials for option 1 (E-4) at 5  Internet access for option 1 (F-4) at 3  My expertise for option 1 (G-4) at 3  Community expertise - option 1 (H-4) at 4 |  |  |
| We can get our spreadsheet to add up all by doing the following:    In cell 4-I type:  =sum(  Take your mouse cursor and highlight all of the cells from B4 to BH  Then type a ) after =sum(B4:H4  You can also just type in =sum(B4:H4) indicating that you want the program to add up everything between B4 and H4  The number that appear should be all of the numbers that you just entered into the cells. |  |  |
| We are close but still don’t have exactly what we need. Let’s add the multipliers into the equation. We still need the sum so we will type in =sum(  But now we need to tell the program that we need to choose option 1 time (B4) multiplied by its importance(\*B3) and add to that option 1 cost (C4) multiplied by it’s importance (C3) plus option 1 tools (D4) times it’s importance (D3) plus option 1 materials (E4) times it’s importance (E3) plus option 1 internet access (F4) times it’s importance (F3) plus option 1 my expertise (G4) times its importance (G3) and finally community expertise (H4) times its importance (H3)  We can enter this into our spreadsheet by typing in the following equation:  =sum((B4\*B3) +(C4\*C3)+(D4\*D3)+(E4\*E3)+(F4\*F3)+(G4\*G3 +(H4\*H3))  Note that the parenthesis tell the computer what to add first. The extra parenthesis at the beginning and end of the equation tell the computer to add up all of the separate, smaller equations. You should check the math by hand and make sure that your equation is working. |  |  |
| To complete you table go to highlight cell I4 and press Ctrl + C. This will copy your formula. Highlight cell I5 and click Ctrl + V.. This will paste your formula into the new row. You need manually edit the second item in each parenthesis from (B4, C4, D4 – the multiplier line) to B3, C3, D3, E3, F3, G3, H3 to correct the formula. Repeat for lines 6 and 7 in your spreadsheet. |  |  |

|  |
| --- |
| **PROBLEM SELECTION & TEAM CONTEXT CLARIFICATION** |
| **Lesson Plan #11** |
| **Unit 2:** Embark & Clarify |

|  |  |
| --- | --- |
| **Grade Level:** 10 -12 | **Instructor:** Sylvia Tiala |
| **Time Allotted:** 2- 50 minute period | **Address:** [tialasyl@gmail.com](mailto:tialasyl@gmail.com)  N4551 446th Street, Menomonie, WI |
| **School District/Organization:**  **C:\Users\Sylvia\Pictures\Sylvia Fold Logo.jpg** | **Date:** June 25, 2018 |
| **Adaptations & Acknowledgments:**  This lesson was adapted from Aerospace as well as Engineering & Virtual Problem Solving courses previously taught at Boone High School in Boone, Iowa. | |
| [Creative Commons License](http://creativecommons.org/licenses/by-nc/4.0/)**Creative Commons License Attribution:**  Problem Solving Curriculum Guide: A Process - Based Approach for Secondary Schools by Sylvia Tiala is licensed under a [Creative Commons Attribution-NonCommercial 4.0 International License](http://creativecommons.org/licenses/by-nc/4.0/) | |

**Brief Description:**

Students will end the Embark and Clarify unit and transition into their problem solving teams over the course of 2 days. Day 1 of this lesson has students completing their Personal Qualifications word cloud and their Decision Matrix. They will use these on the second day of this lesson.

Day 1 of this lesson has students assess themselves on their Problem identification, their brainstorming and communication, and their teamwork efforts. Students will assess themselves on rubrics, and turn those assessment tools into the teacher. The teacher will provide feedback to the students on the same rubric and hand them back. Copies of the student work should be filed in each students’ folders/portfolios to establish a baseline of work that students can use to demonstrate growth.

In order to encourage appropriate educational risk taking, instructors should think about having students come up with their “professional development” plan. The ability to formulate a plan and reflect on what they learned during the last few weeks of the course is more important than having their work “correct”.

**Standards**:

*Wisconsin Standards for Literacy in All Subjects:*

* WHST – 4 Produce clear and coherent writing appropriate to task
* WHST –6 Use technology to produce individual writing
* RST-3 Follow complex multistep procedures
* RST-4 Determine meaning of symbols in domain-specific contexts
* RST-5 Analyze how information is categorized and structured
* SL – 4 Present information and supporting evidence clearly
* SL -5 Make strategic use of digital media
* L-1 Demonstrate command of English when speaking and writing
* L-2 Demonstrate command of capitalization, punctuation, and spelling
* L-3 Use language and conventions when writing, speaking, reading & listening
* L-6 Acquire and accurately use general academic and domain-specific words

*Wisconsin Standards for Information and Technology Literacy:*

* ITL-EL1.d Utilize feedback using digital tools. Analyze data to justify outcomes
* ITL-EL2.d Understand and apply functions and operations
* ITL-ID2.a Know and use a deliberate design process
* ITL-KC2.a Produce creative artifacts for multiple audiences
* ITL-CC1.c Utilize digital tools to analyze and communicate complex ideas
* ITL-GC1.c Select and leverage appropriate digital tools to exchange ideas

*Wisconsin Common Career and Technical Core Standards*

* WCCTS-4c3.a Communicate thoughts and feeling with others
* WCCTS-CD1.a Identify personal strengths, aptitudes and passions
* WCCCTS-CD1.b Demonstrate effective decision-making
* WCCTS-CD4.b Demonstrate skills related to job seeking and application
* WCCTS-IMT1.b Determine the relevance of data and information
* WCCTS-IMT1.c Select relevant information for making decisions
* WCCTS-IMT2.b Prepare media products to communicate a specific lesson

**Students’ Essential Question(s):**

* How can I contribute to my team and this project while building career-related qualifications?

**Learner’s “I Can Statements”**

* I can identify personal strengths and aptitudes
* I am able to use digital tools to create graphics that communicate information
* I can create a decision matrix to inform the problem solving process

**Assessment/Assessment Criteria**

*Formative:*

Problem Identification & Clarification Rubric 8

Finding, Brainstorming & Communicating

Group Evaluation Rubric

*Summative:*

Problem solving process documented as part of final project

**Materials Needed:**

Day 1

Problem Identification & Clarification Rubric from Unit 2 – Lesson 8

Finding, Brainstorming & Communicating Rubric Unit 2 – Lesson 8

Group Evaluation Rubric Unit 2 – Lesson 8

Day 2

Graded rubrics should be copied (for your records) and handed back to students

T-Shirt size sheet

**Vocabulary**

**What do I know about my students that will inform this lesson?**

It is important to remember that the students should own the problem solving process. Problems will be real-world applications. Some students may not complete their projects perhaps due to no fault of their own. This is why the problem solving process, not the product, should be emphasized. Students will need scaffolding and guidance to remain on track. Make sure that you coach students to appropriate projects during this lesson. Be cautious of students selecting high stakes projects that might result in “making or breaking” someone’s business, be a product someone absolutely needs to function, and the like. Remember to get out of students way, become a facilitator and have faith in your students’ ability to do some amazing work!

**How does this lesson connect with and build on previous lesson(s)?**

Brainstorming, narrowing project selections, and reflecting on personal qualifications in past lessons will help students select projects and team up with others as they move forward in the problem solving process.

**How will I (the teacher) build upon this lesson in subsequent lessons?**

This lesson assigns students to teams and projects that they will focus on for the rest of the semester.

**Lesson Implementation**

|  |  |  |
| --- | --- | --- |
| ***Instructor Will*** | ***Time allotted*** | ***Student Will*** |
| *Prepare for class*  Copy the assessments from Unit 2 – Lesson 8:  Problem Identification & Clarification Rubric 8  Finding, Brainstorming & Communicating  Group Evaluation Rubric  They are included under the resources for this lesson as well for convenience  Prepare to assign groups:  At this point in the semester you will begin a transition from an instructor to a facilitator. You need to decide how many projects you can reasonably manage. You will need to decide how to group students to accommodate their interests while remaining manageable for the you, the instructor | 30 minutes |  |
| *Day 1 Anticipatory set*  Today and tomorrow we will be transitioning from identifying problems to selecting project to work on and teams to work with.  Where are all of you at with your word cloud and your decision matrix assignments?  Get feedback from students. | 1 minute | Students engage with the instructor |
| *Day 1 - Introduce Activities*  Today you will have the first 30 minutes of class to work on your Personal Qualifications word cloud and your Decision Matrix. Please have these items ready by tomorrow.  Allow for work time  If some students are finished have them help others who are not finished  Students who are ahead may be interested in starting the next unit by investigating access to computer applications they may find helpful. Does the district block Skype? What about Facebook? Have students start making a list of technologies they do/don’t have access to. | 1 minute | Students listen |
| *Day 1 - Content*  Students work on their assignments for 26 minutes. If the majority of students finish early, adjust the timing an move forward the rest of today’s and tomorrow’s lesson. | 26 minutes | Students work on their word cloud, their decision making matrix and other assignments as directed. |
| *Day 1 Clean UP*  Have students save work and stop what they are doing to allow a transition to the end of unit assessment. | 1 minute | Students clean up |
| *Day 1 - Student Self- Assessment*  Hand out:  Problem Identification & Clarification Rubric  Finding, Brainstorming & Communicating Rubric  Group Evaluation  Have students put their name on the top of each sheet.  Ask them to self-assess their performance on each of the rubrics. Have them reflect on their learning to date, ask questions, or make other comments on the assessments. | 18 minutes |  |
| *Clean Up*  Instruct students to turn in their completed assignments if they are finished.  Direct students to put away materials as per class policy and procedures.  Collect the rubrics so that you can add your own feedback and prepare to hand the rubrics back during the next class meeting. | 1 minute |  |
| *Closure*  Please have your qualifications word cloud completed and printed out for use in class tomorrow.  Please have your decision matrix completed and have a hard copy (alter directions for your scenario) with you as well. | 1 minute |  |
|  |  |  |
| *Day 2 Anticipatory Set*  Good Morning/afternoon everyone. Please pull out your word cloud assignment and your decision matrix.  Take a look at your decision matrix. Look at what the highest scored item is. Does the project that you scored the highest match what you are most interested in doing? Why do you think this is?  -Take time to discuss with students why their decision matrix and what they want to do may or may not match. Discuss the idea of objective decision making. Discuss the idea of building bias into their decision – making tools.  Note: The projects students select and the ones that rated highest on the decision making chart may not be the same. Help students select a project they will enjoy but that they will also be challenged by and will experience success (not necessarily completion but success at learning, trying, and growing). | 3 minutes | Students engage with instructor. |
| *Day 2 – Procedure*  Divide class into sub-groups by interests:  Divide students into groups (for discussion) of similar projects. For example: students who want to work on helping people they know develop an assistive device are in a group; students who want to work on developing a widget for improving a process at work are in a second group. If students have selected the same project then divide them up by the project they have selected. Try to get 5 – 7 students/group  The idea is to start putting students into groups with people that have the same interests and not just the friends they want to work with.  Share Word Clouds:  Instruct students to pull out their word clouds. Spend a few minutes sharing their word clouds with others in the group members. Have students describe what they might bring to a project.  Allow students to repeat the process with others outside of their group if they feel they have something to offer another group.  Select Team Mates  Instruct students to use the information they have to make an informed decision about what project they want to work on and who they want to work with. Provide guidelines:   * No more than X to a group * You may (may not) work alone * Total of XX projects you are willing to undertake * Other criteria you determine   Have them self-select their groups and their problems.  Final groupings:  After students have selected their projects and teams have them report out to you. Record the team problem and members for future reference.  Assign each group to a place in the classroom/lab that will be their assigned seating arrangement for the rest of the semester. Have students move to those spots | 3 minutes  5 minutes  3 minutes  3 minutes  5 minutes |  |
| *Day 2 – Content*  Instruct students:  Now that you have your teams, I want you to do several things for me.  First, introduce yourself to one another. Tell each other about your passions and interests in general. Please use your word cloud to let others know what qualifications you have that will help contribute to your team and the selected problem. You have about 1 minute each.  Next:  Please take the next 5 minutes and discuss your selected problem with each other. You already have it identified but make sure everyone is on the same page. (Note: this is important if students have been grouped according to “similar” projects or there are multiple ideas). What is the problem? Who’s problem is it?  Great! You have a start on getting to know your team members and getting a feel for your problem. For the next 16 minutes I would like you to do 2 things.  First, I am handing a T-shirt sheet around to the class. You will need appropriate attire when you represent your group. We will be getting T-shirts for all of you to wear for these occasions. (Note, modify this if you aren’t able to purchase shirts). Please write your name and circle the size T-shirt you wear on the sheet that is coming around.  The second thing I would like you to do is to come up with an appropriate team name for your group. Also think about what kind of logo you would like to represent your team. Remember, you will be wearing these shirts to represent you and your team. Please keep your team names and logos appropriately focused. | 4 minutes (adjust as needed)  5 minutes  16 minutes |  |
| *Day 2 – Closure*  Thank you all for the great work you did during this unit. We have selected our projects. Tomorrow we will start our unit on communicating. Remember during Unit 1 you identified ideas for measuring learning growth, educational risk taking, and digital literacy. During this unit you have selected a problem. Tomorrow we will start our unit on communication. This upcoming unit will help you decide how you document and communicate your ideas.  (Tie in the next unit to past units and concepts addressed) | 1 minute |  |
| *Day 2 – Cleanup*  Direct students to put books away, hand in T-shirt size sheet, and other as your situation dictates | 1 minute | Students clean up |
| *Day 2 – Reflection*  How can I contribute to my team and this project while building career-related qualifications? | 1 minute | Students reflect |

**Teacher’s Comments/Self-Assessment:** (use this space to reflect on what you would do differently, how the lesson unfolded, notes about students, and the like).

**Lesson 11 Resources**

**T- Shirt Size Sheet**

**Name Size** (circle size needed)

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **S M L XL 2XL 3XL 4 XL**

2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **S M L XL 2XL 3XL 4 XL**

3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **S M L XL 2XL 3XL 4 XL**

4. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **S M L XL 2XL 3XL 4 XL**

5. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **S M L XL 2XL 3XL 4 XL**

6. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **S M L XL 2XL 3XL 4 XL**

7. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **S M L XL 2XL 3XL 4 XL**

8. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **S M L XL 2XL 3XL 4 XL**

9. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **S M L XL 2XL 3XL 4 XL**

10. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **S M L XL 2XL 3XL 4 XL**

11. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **S M L XL 2XL 3XL 4 XL**

12. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **S M L XL 2XL 3XL 4 XL**

13. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **S M L XL 2XL 3XL 4 XL**

14. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **S M L XL 2XL 3XL 4 XL**

15. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **S M L XL 2XL 3XL 4 XL**

16. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **S M L XL 2XL 3XL 4 XL**

17. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **S M L XL 2XL 3XL 4 XL**

18. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **S M L XL 2XL 3XL 4 XL**

19. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **S M L XL 2XL 3XL 4 XL**

20. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **S M L XL 2XL 3XL 4 XL**

# Name:

# Problem Identification & Clarification Rubric ( - Embark & Clarify)

Adapted from: Custer, R., Valesey, B., Burke, B. (2001). An assessment model for a design approach to technological problem solving. *Journal of Technology Education, 12*(2). doi <https://doi.org/10.21061/jte.v12i2.a.1P> Permission for use obtained from Dr. R. Custer 22 July, 2018 ([Rodney.Custer@bhsu.edu](mailto:Rodney.Custer@bhsu.edu))

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Novice** | **Beginner** | **Competent** | **Proficient** | **Expert** |
| **Embark & Clarify** | Exhibits considerable indifference or frustration. Doesn’t see context.  Does not ask questions to and would begin the problem solving process without clarification or questions.  Tends to hone in on wrong problem, isolated subset, or easiest part to solve. | Exhibits some indifference or frustration. Ignores context.  Asks questions but not pertinent and too few to start the problem solving process.  . | Defines problem adequately. Ignores context.  Poses a few pertinent questions that one might need for clarification as they start the problem solving process.  Identifies key content. | Expresses limited knowledge of context or problem. Problem is defined but needs clarification. Ignores context.  Poses some pertinent questions that would help start the problem solving process.  Identifies sub-problems but does not prioritize. | Accurately describes current state of affairs supported by stories, data or other supporting information that demonstrates understanding/ empathy.  Poses pertinent questions that one needs to ask for clarification in order to solve problem.  Identifies and prioritizes sub-problems (within the larger problem). |

**Comments:**

**Name:**

**Finding, Brainstorming & Communicating Rubric (Unit 2:**  **- Embark & Clarify)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Novice** | **Beginner** | **Competent** | **Proficient** | **Expert** |
| **Finding Problems** | My actions are totally teacher directed. I explore problems by following the teacher’s directions in a step-by-step process. I make little effort to search on my own. Educational risk taking and effort is minimal. | I am self-directed at least 50% of the time. I explore problems that take a minimal amount of searching or I search in familiar places taking minimal risks. Some effort made to expand educational risk taking. | I am self-directed at least 65% of the time. I deduce problems from a couple of sources. I make sure to get teacher approval each time I move forward. I am willing to take some educational risk. | I am self-directed at least 80% of the time. I am able to deduce several problems from multiple sources. I request minimal help moving forward. I am willing to try to expand my educational risk taking with teacher support. | I am self-directed more than 85% of the time. I deduce problems by being observant of news sources, readings, media sources, my school and community. I talk to others to find problem-solving opportunities. |
| **Brainstorming** | Brainstorm less than 5 (total) ideas in the Problem Detective Challenge.  Information is missing making it difficult or impossible for others to revisit the idea. | Brainstorm **a minimum of** 5 (total) ideas in one category of the Problem Detective Challenge.  Some information is missing making it a challenge for others to revisit the idea. | Brainstorm **a minimum of**  6 (total) ideas in one category of the Problem Detective Challenge.  Thorough information is included, allowing others to revisit the idea. | Brainstorm **a minimum of** 9 ideas (total) in two or more categories of the Problem Detective Challenge.  Thorough information is included, allowing others to revisit the idea. | Brainstorm **a minimum** of 12 ideas (total) in three or more categories of the Problem Detective Challenge.  Thorough information is included, allowing others to revisit the idea. |
| **Communication**  **Skills** | I have difficulty stating my ideas and connecting to assignment criteria. It is difficult for me to imagine what information my target audience needs or wants. I make an attempt but it lacks focus and clarity.  Numerous errors in grammar, spelling, or punctuation are found. Bullet points and minimal responses are used to convey information  Information is missing | I state my ideas with help from peers and teachers. My ideas and presentations use cookie-cutter templates with little/no attempt to customize elements.  My work addresses some of the assigned criteria but I am unclear who my target audience is or how I might tailor my message to my target audience  Some errors in grammar, spelling, or punctuation are found. Bullet points and minimal responses are used to convey information | I can state my ideas but they lack focus or direction. My ideas and presentations are taken directly from templates with little attempt to add unique or creative elements.  My work addresses many of the assigned criteria and considers a target audience that is not clearly defined.  Minimal errors in grammar, spelling, or punctuation are found. Full sentences - where appropriate – are used to convey information | I can clearly and succinctly state my ideas either professionally OR uniquely. My work addresses most of the assigned criteria and/or a defined target audience.  Proper grammar, spelling, punctuation and full sentences - where appropriate – are used to convey information | I can clearly and succinctly state my ideas both professionally AND uniquely. My work clearly addresses assignment criteria and/or a clearly defined target audience.  Proper grammar, spelling, punctuation and full sentences - where appropriate – are used to convey information |

**Comments:**

Group Evaluation Rubric

**Name:**

Custer, R., Valesey, B., Burke, B. (2001). An assessment model for a design approach to technological problem solving. *Journal of Technology Education, 12*(2). doi <https://doi.org/10.21061/jte.v12i2.a.1> Permission for use obtained from Dr. R. Custer 22 July, 2018 ([Rodney.Custer@bhsu.edu](mailto:Rodney.Custer@bhsu.edu))

|  |  |
| --- | --- |
| All members of the group contributed actively to the process | 5 4 3 2 1 |
| The members achieved an appropriate balance between leadership and followership | 5 4 3 2 1 |
| All members contributed creative ideas to the process | 5 4 3 2 1 |
| The group was able to re-energize when the energy level dropped off | 5 4 3 2 1 |
| The group was able to critique its own work | 5 4 3 2 1 |
| There was a good balance between group and individual work | 5 4 3 2 1 |
| As a whole, the group was flexible and adaptable | 5 4 3 2 1 |
| The group generated many new ideas rather than prematurely selecting a single solution | 5 4 3 2 1 |
| The group was able to incorporate diverse personalities and ideas | 5 4 3 2 1 |
| The group had the ability to resolve adversity (ideas that didn’t work, frustration, etc.) | 5 4 3 2 1 |

# 5 – Absolutely true of this group

**4 – Described the group for the most part**

**3 – Description fit the group about half of the time**

**2 – Only marginally describes the group**

**1 – Does not describe the group at all**

**UNIT 3**

**Organize & Manage**

|  |
| --- |
| **SELECTING DIGITAL TOOLS** |
| **Lesson Plan # 12** |
| **Unit 3:** Organize & Manage |

|  |  |
| --- | --- |
| **Grade Level:** 10 -12 | **Instructor:** Sylvia Tiala |
| **Time Allotted:** 2- 50 minute periods | **Address:** [tialasyl@gmail.com](mailto:tialasyl@gmail.com)  N4551 446th Street, Menomonie, WI |
| **School District/Organization:**  **C:\Users\Sylvia\Pictures\Sylvia Fold Logo.jpg** | **Date:** June 25, 2018 |
| **Adaptations & Acknowledgments:**  This lesson was adapted from Aerospace as well as Engineering & Virtual Problem Solving courses previously taught at Boone High School in Boone, Iowa. | |
| [Creative Commons License](http://creativecommons.org/licenses/by-nc/4.0/)**Creative Commons License Attribution:**  Problem Solving Curriculum Guide: A Process - Based Approach for Secondary Schools by Sylvia Tiala is licensed under a [Creative Commons Attribution-NonCommercial 4.0 International License](http://creativecommons.org/licenses/by-nc/4.0/) | |

**Brief Description:**

This lesson starts a new unit introducing students to the collection, organizing and dissemination of information. During the course students must organize and manage the information they collect. They will disseminate this information in a final project. Information and digital literacy standards asking students to demonstrate their ability to produce and publish writing, to use information and digital resources in a responsible manner, to respect intellectual property rights, and the like are embedded into the course. This lesson asks students to inventory what they already know and to look for emerging applications that may benefit them during their problem-solving activities.

**Standards**:

*Wisconsin Standards for Literacy in All Subjects:*

* RH- 1 Cite textual evidence supporting analysis of sources
* RH- 2 Determine central ideas, provide accurate summaries
* RH- 4 Determine meaning of words/phrases in context of whole text
* RH- 6 Evaluate and assess author’s claims
* RH- 7 Integrate and evaluate multiple sources of information in diverse formats
* RH- 9 Integrate information from diverse sources noting discrepancies
* RST-2 Determine central ideas, summarize complex information
* RST-3 Follow complex multistep procedures used in technical tasks
* RST-5 Analyze how information is categorized and structured
* RST-6 Analyze author’s explanations and identify unresolved issues
* RST-7 Integrate and evaluate multiple sources of information presented in multiple formats
* WHST-2 Write explanatory texts as appropriate for specific disciplines
* WHST-6 Use technology to produce, publish individual writing
* WHST-7 Conduct short research to answer questions
* WHST-8 Gather relevant information for authoritative sources and cite correctly
* WHST-9 Draw evidence from informational texts to support analysis
* WHST-10 Write routinely over extended period for a range of purposes
* SL-2 Integrate multiple sources of information to make decisions
* SL-4 Present information findings clearly
* L-1 Demonstrate command of English grammar
* L-2 Demonstrate command of capitalization, punctuation, and spelling
* L-3 Use language and its conventions

*Wisconsin Standards for Information and Technology Literacy:*

* ITL-KC1.a Plan and employ effective research strategies
* ITL-KC1.c Locate and curate resources from various sources
* ITL-ID2.b Select and use digital resources to plan and manage the design process
* ITL-CT1.b Select an effective digital tool to collect data and verify possible solutions
* ITL-CC1.a Evaluate and determine appropriate platforms and digital tools
* ITL-GC1.c Select and leverage appropriate digital tools to exchange ideas

*Wisconsin Common Career and Technical Core Standards*

* WCCTS-CD1.b Demonstrate effective decision-making
* WCCTS-CD1.d Apply a range of relevant decision-making strategies
* WCCTS-IM1.a Choose appropriate sources of information for a given purpose
* WCCTS-IMT1.c Select relevant information for making decisions and problem solving
* WCCTS-IMT3.a Adopt new technological tools to increase personal and organizational productivity
* WCCTS-IMT3.b Select and use communication and information technology to solve problems and provide opportunities.

**Students’ Essential Question(s):**

* How can I know what skills to learn as technology is continually changing?

**Learner’s “I Can Statements”**

* I can Identify my current level of information/digital literacy
* I can Use an online citation tool to cite sources in APA format

**Assessment/Assessment Criteria**

*Formative:*

Citefast documentation of resources in APA format – correct errors and return to students asking them to fix the errors in Citefast.

*Summative:*

Students will be able to document the problem-solving process in APA format as part of their final project.

**Materials Needed:**

Computers with access to the internet

Digital projector

Citefast website - <https://www.citefast.com/?s=APA>

Taylor video #3 & #4 Retrieved from <https://www.youtube.com/watch?v=USMvfvMszhA&t=9s> <https://www.youtube.com/watch?v=Zvzw_qPkinQ>

Information Technology Survey – student responses from Unit 1, Lesson 2 – returned to students

Standards – Beginning versus End handout

Resources to Get You Started handout

Muddiest Point Card

**Vocabulary**

*Authentic-* real

*Other words from standards that your students may find difficult*

**What do I know about my students that will inform this lesson?**

Students are familiar with social media and digital tools. Some of these can be leveraged appropriately for collaborating, documenting, and sharing information. Allowing students to explore these tools will help them learn how to find appropriate technologies for problem solving. It is expected that they will run into blocked internet sites that will prevent them from using some of the tools they are interested in using. This can lead to discussions about protecting minors, ease of access, and appropriate use of technology. Students may want to leverage administrators and Information Technology personnel to allow access to legitimate collaboration and reporting tools. Be aware that some students may find ways to access blocked sites that they are passionate about.

**How does this lesson connect with and build on previous lesson(s)?**

Students are learning the problem-solving process. This lesson is a miniature problem where students apply the problem-solving process they are learning. The lesson scaffolds student learning as they step through the various elements of the Problem Solving Pentagon introduced at the beginning of the semester.

**How will I (the teacher) build upon this lesson in subsequent lessons?**

Information gathered by students will be used to document and communicate students’ problem-solving expertise. The citation skills students develop during the lesson will be used to document their ongoing work.

**Lesson Implementation**

|  |  |  |
| --- | --- | --- |
| ***Instructor Will*** | ***Time allotted*** | ***Student Will*** |
| *Prepare for class*  Write vocabulary words on the board  List the essential question on the board.  Write the student “I can” statements on the board  Review sources listed for lessons and familiarize yourself with resources. Pay particular attention to the Taylor sources on the Annotated Bibliography. Familiarize yourself with lessons 3 & 4  Review students’ *Information Technology Survey* from Unit 1 Lesson 2 activities. Prepare to hand the surveys back to students/allow access to their submissions if completed electronically.  Review the list of standards that you are using for the course, like that in the *Standards – Beginning versus End of Semester* handout. The standards that are tied to collecting and disseminating information and those that target students’ information and digital literacy skills have been identified. Update the list to reflect those competencies you are targeting in your course. Prepare to make them available to students  Review terminology in the standards and add to the list of vocabulary words to discuss with students.  Review and update the *Lesson 12: Resources to Get You Started* handout.  Determine how much latitude you are willing/able to give students in the selection of the technology and applications they may use. Adjust the lesson accordingly. Another option is to push for increased accessibility to sites of interest.  Insure that students meet the criteria for accessing sites and have the necessary permissions in place to participate in online activities. Make accommodations as needed.  Post link to Citefast <https://www.citefast.com/?s=APA> on board or online.  Practice using Citefast. Get examples of textbooks/sources for students to use with Citefast. Post source titles/authors/ISBN numbers on the board so students can follow the instructional video demo.  Copy Muddiest Point Cards/Post Muddies Point to course management system for student reflection | 45 minutes will be needed to review and post/copy the materials.  Major revisions to standards and updating resources may take additional time. | Not applicable – lesson preparation |
| *Day 1 Anticipatory Set*  Hand back students’ *Information Technology Survey* from Unit 1 Lesson 2 activities.  Good Morning/Afternoon everyone!  Today we are going to start a new unit related to organizing and managing all of the information you will collect and then present as part of your problem-solving activities. If you look at your Problem Solving Pentagons you will see that we are in the “Organizing and Managing” portions of the problem solving process.  We will be using computer apps and programs to help us. So let’s start with this question:  How do you know what apps and programs to learn as technology continues to change?  Take a look your survey from the beginning of the semester. Why did you choose to learn the programs and applications that you listed?  Are there any that you didn’t list? Why? Note: the apps/programs need not be school related. | 1 minute  4 minutes | Students engage in discussion with the instructor. |
| *Day 1 Introduce Activities*  During the first week of school I had you fill out a number of surveys. One of them was the technology survey that I just handed back. We also talked about educational risk taking, learning growth, and information literacy.  As part of this class you will be gathering information as you do your problem solving. You may be brainstorming, doing internet searches, interviewing people, making CAD drawings, perhaps collaborating and talking to each other after school. All of these activities can be used as examples to demonstrate your learning growth, educational risk taking, and developing information literacy skills.  I am asking for your help over the next two days (empower students). We need to find applications that you are excited about using and that   1. Allows you to document your work 2. Allows you to present your final project and 3. Allows you to communicate with each other.   We can use different programs to accomplish this but you and your team mates need to agree on what programs and applications you are going to use. This week our goal is to figure that out. | 2 minutes |  |
| *Day 1Content*  Hand out the *Standards* *– Beginning versus End of Semester* handout.  I have handed out to you (or provide directions for gaining access in a course management system) a list of standards (skills and ideas students should learn) that your teachers see when they think about designing lessons for you. I am giving it to you for two reasons. First, because I think it will help guide you when you are looking for apps and programs to use. So, it is for your guidance. The second reason is that I think it is unfair of me to ask you to demonstrate your digital literacy and use of information technology without giving you clear guidelines. I am NOT asking you to demonstrate all of these. What I will ask of you is to look at the list and see if there are one or two things you might add to your list of skills by the end of the semester.  Let’s start by taking a look at the list. In the next 10 minutes I want you to read each of the items listed. Please ask about any terms or sentences that are confusing. As you read put an X in the column if you feel you could show someone that you already know how to do this particular item. (Consider having students submit these sheets so you can obtain a copy of them. Return to students after copying. It is a potential way for students to show growth).  Now let’s use the sheet to try and find apps and programs that will help us organize and manage information during the rest of the semester.  Hand out *Lesson 12 Resources to Get You Started* sheet.  Walk students through the major categories and what they might find. Encourage them to explore programs and applications. Briefly explain what COPPA is and how it is tied to the School’s Acceptable Use Policy.  The Resources to get you started sheet has a number of links to get you started. Many of the links have additional information on them. However, there is one resource called Citefast that will help all of you document your exploration as part of this assignment and will help you with other research projects in the future. Let’s take a look at Taylor’s video on writing annotated bibliographies using Citefast. Taylor’s 3rd and 4th video walks you through an excellent source that you can use to cite sources. It is an excellent tool to help you in documenting your writing, photos, interview and the like. Let’s take a look at using the APA formatting (APA formatting is specifically selected because the engineering and educational focused work they will be doing in this class would require APA formatting if published or disseminated).  Walk Students through Taylor’s 3rd and 4th video. Pause as necessary to enable students to follow along. Provide some context before starting. Let students know that as they complete their projects they need to cite sources. This includes ideas as well as direct quotes. Reinforce the fact that it applies to songs, photographs, interviews, and ideas that came from others. | 8 minutes  2 minutes  1 minute  23 | Students will check off items from the list they feel they are capable of.  Students refer to the 12 Resources to Get You Started Sheet.  Students follow along with Taylor’s Annotated Bibliography/Citefast video exercise |
| *Day 1Student Practice*  Give students several citations from the class/school to practice with. Use a variety of formats for examples. Use items that may be foreign to them such as an email, a photograph, a video, and the like | 4 minutes | Students practice with additional citation resources provided. |
| *Day 1Clean Up*  Instruct students to clean up as per course policy and your specific situation | 1 minute | Students clean up |
| *Day 1Closure*  Today we looked at different types of activities that fall under the category of digital/information literacy. We took a look and your current skill level. You added one tool to your repertoire | 1 minute | Students listen |
| *Day 1Reflection:*  Day 1:  Hand out/provide access to Muddiest Point card.  Please use the next 3 minutes to reflect on today’s lesson and write down the point you found the muddiest and that you would like clarified | 3 minutes | Students reflect and submit cards |
|  |  |  |
| *Day 2 Introduction*  Today you will be searching for applications that you and your team mates will be using to document your work as individuals, as teams, and perhaps for the whole class.  As you look for applications you want to use please do the following:   1. Cite the app/program in Citefast.   Use the annotation feature to indicate:   1. The app/program is accessible from the school (does the school block the program?) 2. The apps/programs should be free. Do not spend money or sign up for an app/program that asks you to pay. 3. If there is a limited time that you can use the “free demo” make sure it is long enough for you to complete your project. I discourage use of apps that have time limits 4. Make sure that the apps DO NOT require you log in through a social media site. 5. Make sure that you check the guidelines for use and that you and your team members meet these guidelines. | 2 minutes | Students listen as you provide direction |
| *Day 2 Student Practice*  Allow time for students to look for tools they want to use to document their work. | 43 minutes | Students look for applications that they might use to document their work. |
| *Day 2 Clean Up*  Instruct students to clean up  Have students submit CiteFast results – printed or electronic – to allow you to correct APA formatting issues. Provide feedback in a timely manner and have students correct errors. | 1 minute | Students clean up as per directions |
| *Day 2 Closure*  Today we looked at applications that we can use during to communicate our ideas with one another and to document learning growth, educational risk taking, and digital literacy. Tomorrow we will have guest speakers come to talk to you about ethical and appropriate use of information that you collect. Our guests will be:  Tell students who is coming. They will be addressing the following questions:  Provide summary of questions that will be asked (modify your question request of guest speakers as applicable).   1. What is plagiarism? 2. What do I need to cite 3. Consequences of not citing 4. How does the COPPA law impact the students? Teachers? The District? 5. How do you use digital tools to increase communication and productivity in business and industry? 6. What strategies can I use to best translate the skills I learn in class to a resume for a future employer?   You will have 12 minutes to ask our panel questions. Please think about questions you may want to ask. | 1 minute | Students listen |
| *Day 2 Reflection*  How can I know what skills to learn as technology is continually changing?  Direct students to submit answers as per instructor/course requirements | 3 minutes | Students will reflect on essential question |

**Teacher’s Comments/Self-Assessment:** (use this space to reflect on what you would do differently, how the lesson unfolded, notes about students, and the like).

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University of Adelaide (2006). *Research skill development for curriculum design and assessment.* Retrieved from <https://www.adelaide.edu.au/rsd/>

University of Wisconsin Stout (2018, July). *Research at UW-Stout.* Retrieved from <https://libguides.uwstout.edu/teachingresearch/rsd>

University of Wisconsin Stout (2018). *Undergraduate student research: Creative and critical thinking at UW Stout.* Available at [http://www2.uwstout.edu/content/lib  
/tutorial/undergraduateresearch/index.html](http://www2.uwstout.edu/content/lib/tutorial/undergraduateresearch/index.html)

Willison, J. & O’Regan, K. (2007). Commonly known, commonly not known, totally unknown: a framework for students becoming researchers. *Higher Education Research and Development 26* (4), pp393-409.Retrieved from: <https://www.adelaide.edu.au/rsd/framework/explanation/> (click on Published article explaining the RSD link).

Young, A. (2016, May 1). *Plagiarism: Lesson one.* Retrieved from <https://www.youtube.com/watch?v=Ly_AeHl4t5M>

**Lesson 12 Resources**

Standards – Beginning versus End of Semester

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Wisconsin Writing Standards for Literacy in All Subjects\***  **(Writing) & (Speaking & Listening)**  **Grades 11-12**  \*Please see standards at [https://dpi.wi.gov/sites/default/files/imce/standards /pdf/las-stds.pdf](https://dpi.wi.gov/sites/default/files/imce/standards/pdf/las-stds.pdf) for detailed description and explanation. | | | **Beginning** | **End** |
| WHST - 6 | | Use technology to produce, publish, update, edit individual/shared writing. |  |  |
| WHST - 8 | | Gather relevant information for authoritative sources & cite correctly |  |  |
| SL - 1 | | Initiate/participate in a range of collaborative discussions |  |  |
| SL -4 | | Present information, findings, and supporting evidence clearly |  |  |
| SL -5 | | Make strategic use of digital media |  |  |
| **Wisconsin Standards for Information and Technology Literacy\***  **(Empowered Learner), (Digital Citizen) &(Knowledge Constructor) Grades 9-12**  \*Please see standards at <https://dpi.wi.gov/sites/default/files/imce/imt/pdf/itlstandardsfinaladopted.pdf> for detailed description and explanation. | | | **Beginning** | **End** |
| ITL –EL1.a | Set goals and reflect using digital tools | |  |  |
| ITL –EL1.b | Build network to support learning and connect with experts and peers to enhance learning | |  |  |
| ITL –EL1.c | Create personalized learning environment in ways that maximize the learning process | |  |  |
| ITL –EL1.d | Seek and utilize feedback using digital and non-digital tools. Analyze data to make adjustments and justify outcomes | |  |  |
| ITL –EL2.a | Understand and apply functions and operations. Choose, and troubleshoot current digital tools. | |  |  |
| ITL –EL3.a | Transfer knowledge to emerging technology. Investigate the creation of new technologies. | |  |  |
| ITL –DC1.a | Cultivate and manage digital identity and reputation | |  |  |
| ITL –DC1.b | Manage personal data to maintain digital privacy and security. | |  |  |
| ITL –DC2.a | Use information, media and digital resources in a responsible manner. | |  |  |
| ITL –DC2.b | Respect intellectual property rights. Gain permission to use copyrighted material. Understand consequences of plagiarism. | |  |  |
| ITL –DC2.c | Recognize rights and responsibilities of intellectual freedom. Ensure others have equitable access to media/technology | |  |  |
| ITL –KC1.b | Evaluate accuracy, perspective, credibility, relevance of information, media, data and the like | |  |  |
| ITL –KC1.c | Locate and curate resources from various sources and organize into collections for varying projects & purposes | |  |  |
| ITL –KC2.a | Produce creative artifacts for multiple audiences. Demonstrate meaningful connections or conclusions. Consider how crowdsourcing impacts online and offline. | |  |  |
| ITL –KC2.b | Build knowledge through active exploration of real-life issues/problems. Use digital resources and tools to engage others. | |  |  |
| **Wisconsin Standards for Information and Technology Literacy\***  **(Innovative Designer) & (Computational Thinker)**  **Grades 9-12**  \*Please see standards at <https://dpi.wi.gov/sites/default/files/imce/imt/pdf/itlstandardsfinaladopted.pdf> for detailed description and explanation. | | | **Beginning** | **End** |
| ITL –ID1.a | Find authentic problems in local and global contexts | |  |  |
| ITL –ID2.b | Select and use digital resources to plan and manage a design process that considers design constraints and calculated risks. | |  |  |
| ITL –CT1.a | Create and articulate a precise and thorough description of a problem designed to utilize digital tools, data analysis, abstract modeling or algorithmic thinking to facilitate a solution. | |  |  |
| ITL –CT1.b | Select an effective digital tool to collect data, design, code, test, and verify possible solutions to reflect on the data to solve authentic problems. | |  |  |
| **Wisconsin Standards for Information and Technology Literacy\***  **(Creative Communicator) & (Global Collaborator)**  **Grades 9-12**  \*Please see standards at <https://dpi.wi.gov/sites/default/files/imce/imt/pdf/itlstandardsfinaladopted.pdf> for detailed description and explanation.. | | | **Beginning** | **End** |
| ITL –CC1.a | Evaluate and determine appropriate platforms and digital tools to create, communicate, and share content effectively with an authentic audience. | |  |  |
| ITL –CC1.b | Create works for an authentic audience that reflects responsible remixing of digital and Fair Use content. | |  |  |
| ITL –CC1.c | Utilize digital tools to analyze, modify, and communicate complex ideas, data, and solutions to an authentic audience | |  |  |
| ITL –GC1.a | Use digital tools to connect with learners from a variety of backgrounds and cultures, engaging with them in ways that broaden mutual understanding and learning. | |  |  |
| ITL –GC1.c | Select and leverage appropriate digital tools to contribute to and collect information from the exchange of ideas within and beyond the learning community. | |  |  |
| ITL –GC2.a | Leverage collaborative digital tools to work with others – including peers, experts, and community members – to learn about issues and problems and to solicit diverse local and global perspectives to discuss solutions for social change. | |  |  |
| ITL –GC2.b | Explore and analyze local and global issues and leverage collaborative digital tools to work with others to investigate, develop, and actualize solutions | |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Wisconsin Common Career and Technical Core Standards\***  **(Information, Media & Technology)**  **Grades 9-12**  \*Please see standards at [https://dpi.wi.gov/sites/default /files/imce/cte/pdf/WCCTS\_Standards.pdf](https://dpi.wi.gov/sites/default/files/imce/cte/pdf/WCCTS_Standards.pdf) for detailed description and explanation. | | **Beginning** | **End** |
| WCCTS -IMT1.a | Choose appropriate sources of data and information for a given purpose. |  |  |
| WCCTS -IMT1.b | Determine the relevance, validity and timeliness of data and information. |  |  |
| WCCTS -IMT1.c | Select relevant information necessary for making decisions and solving problems. |  |  |
| WCCTS -IMT1.d | Apply data and information to communicate ideas and create new opportunities. |  |  |
| WCCTS -IMT2.a | Analyze media messages to determine biases and objectivity. |  |  |
| WCCTS -IMT2.b | Prepare media products in order to communicate a specific message. |  |  |
| WCCTS -IMT3.a | Adopt new technological tools to increase personal and organizational productivity. |  |  |
| WCCTS -IMT3.b | Select and use communication and information technology to help solve problems and provide opportunities. |  |  |

**Lesson 12: Resources to Get You Started**

Keep track of the following information using Citefast as you explore apps and programs that you are interested in using for this class. Use Citefast and the annotation feature to cite and record the following information about the apps/programs you find.

1. Cite the app/program in Citefast.

Use the annotation feature to indicate:

1. The app/program is accessible from the school (does the school block the program?)
2. The apps/programs should be free. Do not spend money or sign up for an app/program that asks you to pay.
3. If there is a limited time that you can use the “free demo” make sure it is long enough for you to complete your project. I discourage use of apps that have time limits
4. Make sure that the apps DO NOT require you log in through a social media site.
5. Make sure that you check the guidelines for use and that you and your team members meet these guidelines.

**Links and Categories to get you started**

**Blogs/Surveys/Portfolios – Individual/Group**

Dyer, K. (2018, January 9). The ultimate list – 65 digital tools and apps to support formative assessment practices.

Edublogs (2018). *Easy blogging for education.* Retrieved from <https://edublogs.org/>

Weebly (2018). Weebly for education. Retrieved from <https://education.weebly.com/>

**Citing Sources**

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**Collaborating With Others**

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Zoom (2018). *Zoom* (video conferencing). Retrieved from <https://zoom.us/?zcid=1288&gclid=CjwKCAjwns_bBRBCEiwA7AVGHvKy0fmC6ARy26k4IBFZLqoJVF_24TC5rIhvVsVA4q-xSJ34ROhxwhoCGCAQAvD_BwE>.

**Laws to protect children and students**

COPPA.org (n.d.). *COPPA – children’s online privacy protection act.*  Retrieved from [http://www.coppa.org/#](http://www.coppa.org/)

**Presentation Applications**

Common Sense (n.d.). Best classroom tools for presentations and slide shows. Retrieved from <https://www.commonsense.org/education/top-picks/best-classroom-tools-for-presentations-and-slide-shows>

Guay, M. (2018, June 18). *The 13 best presentation apps in 2018* [Blog post]*.* Retrieved from <https://zapier.com/blog/best-powerpoint-alternatives/>

**Web Pages**

Duebel, P. (2018, August 5). *Technology integration: Web page design.* Retrieved from <http://www.ct4me.net/web_page_design.htm#Design%20Resources>

Muddiest Point Card

Please use the next 3 minutes to reflect on today’s lesson and write down the point you found the muddiest and that you would like clarified

\_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_\_ \_ \_ \_ \_ \_ \_ \_ \_ \_ Cut Line \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_

Muddiest Point Card

Please use the next 3 minutes to reflect on today’s lesson and write down the point you found the muddiest and that you would like clarified

|  |
| --- |
| **ETHICAL AND APPROPRIATE USE** |
| **Lesson Plan # 13** |
| **Unit 3:** Organize & Manage |

|  |  |
| --- | --- |
| **Grade Level:** 10 -12 | **Instructor:** Sylvia Tiala |
| **Time Allotted:** 1- 50 minute period | **Address:** [tialasyl@gmail.com](mailto:tialasyl@gmail.com)  N4551 446th Street, Menomonie, WI |
| **School District/Organization:**  **C:\Users\Sylvia\Pictures\Sylvia Fold Logo.jpg** | **Date:** June 25, 2018 |
| **Adaptations & Acknowledgments:**  This lesson was adapted from Aerospace as well as Engineering & Virtual Problem Solving courses previously taught at Boone High School in Boone, Iowa. | |
| [Creative Commons License](http://creativecommons.org/licenses/by-nc/4.0/)**Creative Commons License Attribution:**  Problem Solving Curriculum Guide: A Process - Based Approach for Secondary Schools by Sylvia Tiala is licensed under a [Creative Commons Attribution-NonCommercial 4.0 International License](http://creativecommons.org/licenses/by-nc/4.0/) | |

**Brief Description:**

Students are introduced to a panel of experts that will discuss:

* Ethical use of information by recognizing when and how to cite sources and the consequences of not citing sources appropriately.
* COPPA laws and how they impact students, parents, schools and libraries. Why do students need to adhere to an acceptable use policy?
* Using digital tools to increase communication and productivity in business and industry

**Standards**:

*Wisconsin Standards for Literacy in All Subjects:*

* SL-1 Evaluate a speaker’s point of view
* L-1 Demonstrate command of English when speaking
* L-5 Demonstrate understanding figurative language and nuances

*Wisconsin Standards for Information and Technology Literacy:*

* ITL-CC1.b Create works that that reflects responsible remixing and use of others’ work
* ITL-DC1.a Cultivate and manage a digital identity and reputation

*Wisconsin Common Career and Technical Core Standards*

* WCCTS-CD3.b Examine opportunities that could enhance life and career plans

**Students’ Essential Question(s):**

* How do I ethically and responsibly use information?

**Learner’s “I Can Statements”**

* I can identify ways to use information and information technologies ethically and responsibly

**Assessment/Assessment Criteria**

*Formative:*

Identify and utilize procedures that reflects the ethical and responsible use of information and information technologies

*Summative:*

Create works that that reflects ethical and responsible remixing and use of others’ work that is cited properly

**People & Materials Needed:**

Library Media Specialist – speaking to citing sources and ethical use of others’ work

See - Invitation to Speak – Sample Letter/Emails – Media Specialist resource

Instructional Technology Coordinator – speaking to COPPA rules and implications

See - Invitation to Speak – Sample Letter/Emails – IT Coordinator resource

Business/Industry Person – speaking to how digital tools are used

See Invitation to Speak – Sample Letter/Emails – Business/Industry resource

Half-sheets of paper or notecards for end of hour reflection

Thank you notes – 1 for each speaker sent after they spoke in your classroom

**Vocabulary**

*As needed per guest speaker*

**What do I know about my students that will inform this lesson?**

Students may be aware that they need to cite direct quotes. Many are unaware of the need to cite ideas, photographs (even from friends and family), to get permission when posting photos of others, and similar issues when they are using others’ information. This activity is designed to increase their awareness and appropriate and ethical use of the technology and information.

**How does this lesson connect with and build on previous lesson(s)?**

Students may experience frustration during the previous lesson as they run into blocked internet sites (potentially) that will prevent them from using some of the tools they are interested in using. Frustrations students’ experience provides an opportunity to engage with discussions about protecting minors, ease of access, and appropriate use of technology. Students may want to leverage administrators and Information Technology personnel to allow access to legitimate collaboration and reporting tools. Be aware that some students may find ways to access blocked sites that they are passionate about.

**How will I (the teacher) build upon this lesson in subsequent lessons?**

Students will be expected to demonstrate ethical and responsible use of information and information technologies throughout the semester.

**Lesson Implementation**

|  |  |  |
| --- | --- | --- |
| ***Instructor Will*** | ***Time allotted*** | ***Student Will*** |
| *Prepare for class*  Review and modify the *Invitation to Speak – Sample Letter/Email* resource  Recruit speakers for panel discussion  Write vocabulary words on the board  Write the student “I can” statement on the board  Write names of guest speakers with positions and company identifiers on board  Set up the room to allow for panel discussion | You will need to plan ahead for this lesson. Allow several weeks – minimum to invite and secure guest speakers.    60 minutes distributed over multiple days may be needed to coordinate the event. |  |
| *Anticipatory set*  Good morning/afternoon everyone.  How do all of you demonstrate ethical use of information and information technologies?  Spend a minute or so getting examples from students. | 2 minutes | Students respond to question and discuss. |
| *Introduce Activities*  Today we have three speakers who are going to talk to us about ethical and responsible use of information and information technologies  Introduce guest speakers:  Name  Where they work  What they do relative to the discussion | 3 minutes | Students listen as speakers are introduced |
| *Content*  The format for today will be as follows:  Each of our guests will have 10 minutes to address their questions. After all the presenters have spoken we will open the floor to questions. I will give all presenters a 5 minute and 1 minute warning.  We will start with (insert name) our library and media specialist (adapt as needed) who will talk about:   1. What is plagiarism? 2. What do I need to cite (please bring examples of items students don’t typically consider such as photographs, videos, interviews, music) 3. Consequences of not citing   (Time presentation and give 5 minute and 1 minute warnings. Moderate presentation to end on time)  Next we have (insert name) our IT director (adapt as needed) who will address two questions:  1. What is COPPA?   1. What strategies can students use to protect my digital identity and reputation? 2. How do students manage personal data to maintain privacy?   (Time presentation and give 5 minute and 1 minute warnings. Moderate presentation to end on time)  We will wrap up today’s panel with (insert name) from (adapt as needed) who will give you some ideas:   1. How do you use digital tools to increase communication and productivity in business and industry? 2. What strategies can I use to best translate the skills I learn in class to a resume for a future employer?   (Time presentation and give 5 minute and 1 minute warnings. Moderate presentation to end on time)  After presenters open the floor to students and their questions. Have some questions to engage moderators in case students have none to ask. | 30 minutes  12 minutes | Students listen to speakers  Students ask question of speakers |
| *Student Practice*  Ethical and responsible use of technology will be demonstrated throughout the rest of the semester | 0 minutes | Students will have applied what they learned throughout the semester |
| *Clean Up*  Not applicable | 0 minutes | Not applicable |
| *Closure*  Let’s give our speaker a round of applause for coming to speak to use today  (Send thank you notes to speakers. Consider having students sign the notes as well). | 1 minute | Students listen |
| *Reflection:*  How do I ethically and responsibly use information and information technologies?  Provide group feedback to students’ reflections questions. Write positive comments on cards or suggestions for improvement before returning cards to students. Consider “Sunshine Calls/Emails” (positive calls) to parents. Consider keeping a copy of reflections for documentation of appropriate behavior and to show student growth. | 2 minutes | Students respond to reflection question |

**Teacher’s Comments/Self-Assessment:** (use this space to reflect on what you would do differently, how the lesson unfolded, notes about students, and the like).

**References:**

Insert names of your local resources and speaker here. Include name, address, telephone, email. Include area of expertise

**Lesson 13 Resources**

Invitation to Speak – Sample Letter/Emails – Media Specialist

modify and format as appropriate

Dear (Name of Library/Media Specialist)

I am working with X number of students in my (name of class) course. The class is dedicated to teaching students how to find and solve problems. In our next unit students will be finding online applications and programs that allow them to document the problem- solving process, to work collaboratively and to report results. As part of this process I would like them to consider how to use information and information technologies responsibly.

I am writing/emailing to invite you to come our class on (insert date) at (insert time) and participate in a panel discussion. You would have 10 minutes to address the following questions:

1. What is plagiarism?

2. What do I need to cite (please bring examples of items students don’t typically consider such as photographs, videos, interviews, music)

1. Consequences of not citing

Students will have an opportunity to ask questions after all of the participants have presented.

Thank you for considering this request. Please let me know if you are able to participate in this discussion by responding to me by (insert date) at:

Insert mailing address

Insert email address

Insert telephone number

I look forward to hearing from you regarding this invitation to speak to my students.

Sincerely

Your name

Invitation to Speak – Sample Letter/Emails – IT Coordinator

modify and format as appropriate

Dear (Name of Instructional Technology Coordinator)

I am working with X number of students in my (name of class) course. The class is dedicated to teaching students how to find and solve problems. In our next unit students will be finding online applications and programs that allow them to document the problem- solving process, to work collaboratively and to report results. As part of this process I would like them to consider how to use information and information technologies responsibly.

I am writing/emailing to invite you to come our class on (insert date) at (insert time) and participate in a panel discussion. You would have 10 minutes to address the following questions:

1. What is COPPA?
2. What strategies can I use to protect my digital identity and reputation?
3. How do students manage personal data to maintain privacy?

Thank you for considering this request. Please let me know if you are able to participate in this discussion by responding to me by (Insert date) at:

Insert mailing address

Insert email address

Insert telephone number

I look forward to hearing from you regarding this invitation to speak to my students.

Sincerely

Your name

Invitation to Speak – Sample Letter/Emails – Business/Industry

modify and format as appropriate

Dear (Name of Business/Industry Representative)

I am working with X number of students in my (name of class) course. The class is dedicated to teaching students how to find and solve problems. In our next unit students will be finding online applications and programs that allow them to document the problem- solving process, to work collaboratively and to report results. As part of this process I would like them to consider how to use information and information technologies responsibly.

I am writing/emailing to invite you to come our class on (insert date) at (insert time) and participate in a panel discussion. You would have 10 minutes to address the following questions:

1. How do you use digital tools to increase communication and productivity in business and industry?
2. What strategies can I use to best translate the skills I learn in class to a resume for a future employer?

Thank you for considering this request. Please let me know if you are able to participate in this discussion by responding to me by (insert date) at:

Insert mailing address

Insert email address

Insert telephone number

I look forward to hearing from you regarding this invitation to speak to my students.

Sincerely

Your name

|  |
| --- |
| **USING DIGITAL TOOLS** |
| **Lesson Plan # 14** |
| **Unit 3:** Organize & Manage |

|  |  |
| --- | --- |
| **Grade Level:** 10 -12 | **Instructor:** Sylvia Tiala |
| **Time Allotted:** 2- 50 minute periods | **Address:** [tialasyl@gmail.com](mailto:tialasyl@gmail.com)  N4551 446th Street, Menomonie, WI |
| **School District/Organization:**  **C:\Users\Sylvia\Pictures\Sylvia Fold Logo.jpg** | **Date:** June 25, 2018 |
| **Adaptations & Acknowledgments:**  This lesson was adapted from Aerospace as well as Engineering & Virtual Problem Solving courses previously taught at Boone High School in Boone, Iowa. | |
| [Creative Commons License](http://creativecommons.org/licenses/by-nc/4.0/)**Creative Commons License Attribution:**  Problem Solving Curriculum Guide: A Process - Based Approach for Secondary Schools by Sylvia Tiala is licensed under a [Creative Commons Attribution-NonCommercial 4.0 International License](http://creativecommons.org/licenses/by-nc/4.0/) | |

**Brief Description:**

Students will select the digital tools that they are interested in using to communicate with one another, document their team work, document their individual work, demonstrate learning growth, and demonstrate educational risk taking. There will be a variety of tools students can use and they need time to explore and use some of the tools that they can use. During this lesson they will reconcile what they want to use and what they are able to use given a variety of constraints such as access, cost, ease of use, and the like.

**Standards**:

*Wisconsin Standards for Literacy in All Subjects:*

* RH- 2 Determine central ideas, provide accurate summaries
* RH-3 Evaluate explanations, determine best fit with evidence, identify uncertainties
* RH- 4 Determine meaning of words/phrases in context of whole text
* RH- 6 Evaluate and assess author’s claims
* RH- 7 Integrate and evaluate multiple sources of information in diverse formats
* RH-9 Evaluate author’s claims & evidence by challenging with additional information
* RST-2 Determine central ideas, summarize complex information
* RST-3 Follow complex multistep procedures used in technical tasks
* RST-5 Analyze how information is categorized and structured
* RST-6 Analyze author’s explanations and identify unresolved issues
* RST-7 Integrate and evaluate multiple sources of information presented in multiple formats
* WHST-6 Use technology to produce, publish individual writing
* WHST-8 Gather relevant information for authoritative sources and cite correctly
* WHST-9 Draw evidence from informational texts to support analysis
* WHST-10 Write routinely over extended period for a range of purposes
* SL-1 Initiate/participate in a range of collaborative discussions
* SL-2 Integrate multiple sources of information to make decisions
* SL-4 Present information findings clearly
* SL-5 Make strategic use of digital media
* SL-6 Adapt speech to a variety of contexts and tasks
* L-1 Demonstrate command of English grammar
* L-2 Demonstrate command of capitalization, punctuation, and spelling
* L-3 Use language and its conventions

*Wisconsin Standards for Information and Technology Literacy:*

* ITL-EL1.c Create personalized learning environment in ways that maximize learning
* ITL-DC1.a Cultivate and manage digital identity and reputation
* ITL-DC1.b Manage personal data to maintain digital privacy
* ITL-DC2.a Use information, media and digital resources in a responsible manner.
* ITL-CC1.a Evaluate and determine appropriate platforms and digital tools
* ITL-GC1.c Select and leverage appropriate digital tools to exchange ideas
* ITL-GC2a Leverage collaborative digital tools to work with others

*Wisconsin Common Career and Technical Core Standards*

* WCCTS-4c2.a Develop effective resolutions for a given problem
* WCCTS-4c2.b Develop and implement a resolution for a new situation using personal experience
* WCCTS-4c3.a Communicate thoughts and feeling with others
* WCCTS-4c3.b Work collaboratively with others
* WCCTS-4c3.c Use interpersonal skills to resolve conflicts . . . (potentially used)
* WCCTS-CD1a Identify personal strengths, aptitudes and passions
* WCCTS-CD1.b Demonstrate effective decision-making
* WCCTS-CD1.d Apply a range of relevant decision-making strategies
* WCCTS-CD1.c Interact effectively with others in . . . teams
* WCCTS-CD4.d Develop positive relationships with others
* WCCTS-GCA2.a Work effectively with diverse individuals in a variety of settings
* WCCTS-IMT3.a Adopt new technological tools to increase personal and organizational productivity
* WCCTS-IMT3.b Select and use communication and information technology to solve problems and provide opportunities.

**Students’ Essential Question(s):**

* How do I responsibly organize and manage my personal and professional communications?

**Learner’s “I Can Statements”**

* I can select and use digital tools to document my learning
* I can select and use digital tools to document my problem solving abilities

**Assessment/Assessment Criteria**

*Formative:*

Ability to work efficiently inside and outside the class/lab using information technologies

Students are able to document their learning growth and appropriate educational risk taking using information technology and digital tools

*Summative:*

Students will be able to document their individual and team problem-solving process

**Materials Needed:**

Computers with access to the internet

Information Technology rubric – developed by students (may have been handed back)

Appropriate Educational Risk rubric – developed by students (may have been handed back)

Learning Growth rubric – developed by students (may have been handed back)

*Using Digital Tools Handout*

*Standards: Beginning versus End of Semester* handout – returned to students from Lesson 12 activities.

**Vocabulary**

**What do I know about my students that will inform this lesson?**

Students will have different skill level and different familiarity with the digital tools that they found. Students may fall back on tools they are comfortable using. Students are also capable of teaching their skills to others. Teamwork and collaboration may be reinforced as students peer teach their team mates how to use the digital tools that are selected for teamwork, collaboration and reporting information.

Individual students may choose to demonstrate their learning differently than their team mates. Allow students to document their own growth in their own unique way.

**How does this lesson connect with and build on previous lesson(s)?**

The digital tools students elect to use during the remaining of the semester will be selected from tools they have identified in lesson 12. Students should be aware and able to document their work ethically and responsibly as they apply information from lesson 13 to their own problem solving processes.

**How will I (the teacher) build upon this lesson in subsequent lessons?**

Digital technologies will be used by students to document and communicate their problem-solving expertise in their ongoing work.

**Lesson Implementation**

|  |  |  |
| --- | --- | --- |
| ***Instructor Will*** | ***Time allotted*** | ***Student Will*** |
| *Prepare for class*  Review the technologies selected by students. Make sure they are viable options and students have access.  List the essential question on the board.  Write the student “I can” statements on the board  Review the resources in the resource list. This matches information students received in lesson 12. Be prepared to guide them toward applications that will best help them document their problem solving and learning growth.  Review the *Using Digital Tools Handout.* Modify it as necessary to meet your course/program/school criteria  Determine how much latitude you are willing/able to give students in the selection of the technology and applications they may use. Adjust the lesson accordingly.  Insure that students meet the criteria for accessing sites and have the necessary permissions in place to participate in online activities. Make accommodations as needed.  Set a *Using Digital Tools* handout on each student’s desk or provide access in course management system, or as situation allows.  Arrange class so students are sitting with their team mates | 60 minutes | Not applicable – lesson preparation |
| *Day 1 Anticipatory Set*  Good Morning/Afternoon everyone!  Two days ago I gave you time to look at digital tools to use in this class. Who wants to share what they found?  Take 2 minutes to get some ideas from students.  Adapt if necessary, or be prepared to provide an example of your own in case no student responds | 2 minutes | Students engage in discussion with the instructor. |
| *Day 1 Introduce Activities*  Over the next 2 days you will have time for your group to choose the tools you want to use for your group work.  As an individual you will choose how you want to demonstrate your learning and educational risk taking.  You will have work today and tomorrow to make your selections. If you find that your selected tools aren’t working for you, or if you need additional tools to get a job done you are welcome or add to the tools you are using. I deliberately left the exploration assignment open ended to encourage all of you to discover the tools that are available. My goal was to make sure that you knew you had a lot of options available. By exploring and learning new tools you are helping me learn as well. I appreciate you doing that for me. Thank you (acknowledge in some way that students have expertise you can learn from). | 2 minutes | Students listen |
| *Day 1Content*  Let’s get started with the Using Digital Tools handout. There are 3 questions listed there. Take 3 minutes and in your group please share:  What apps/programs did you find that you would like to use to communicate with each other outside of class? (List, discuss, decide – consider using a decision matrix)  Please take another 3 minutes and discuss:  What apps/programs did you find that you would like to document your project (photos, documents, brainstormed ideas)? (List, discuss, decide-consider using a decision matrix)  One more time. Please take 3 minutes and discuss:  What apps/programs did you find that you could use for interacting with others outside your class (polls, surveys, free long-distance conferencing)  Who would like to give me an example of an app or program you found?  (Take time to get feedback from students) | 3 minutes  3 minutes  3 minutes | Students discuss the question  Students discuss the question |
| *Day 1Student Practice*  Use the rest of your time today by working with your group members to first select the digital tools you want to work with this semester. Make sure you come to a consensus. Use your *Standards: Beginning versus End of Semester* handout and ask questions if you need help.  Try out the applications you have selected and make sure they work. Add each other to teams or invite each other to collaborate. Find out if your applications work  Note: this activity may need to be modified depending on access t the Internet.  Walk around the room helping students find and select tools, to log on and try to communicate with one another, and the like. Help them make connections between the text on *Standards* sheet from Lesson 12 if needed. | 35 minutes | Students practice using things such as polls, wiki pages, |
| *Day 1Clean Up*  Instruct students to clean up as per course policy and your specific situation | 1 minute | Students clean up |
| *Day 1Closure*  Today we looked at applications for your group. Tomorrow we will look at how you will organize information and document your learning for yourself. | 1 minute | Students listen |
|  |  |  |
| *Day 2 Introduction*  Yesterday you looked at applications for you group. Let’s return to the Using Digital Tools handout  Please take 2 minutes and jot down as many ideas as you have for what. Think about how you might document this. Do you have pictures, reflections, drawings or other things that would help you show what you have learned?  Next, take 2 minutes to jot down some examples of educational risks you have taken. Once again please indicate how you would demonstrate this. | 1 minutes  2 minutes  2 minutes | Students listen as you provide direction  Students jot down notes.  Students jot down notes |
| *Day 2 Student Practice*  Now I want you to take the ideas you just wrote down and document these ideas using the digital applications you chose for yourself. This is the time for you to start your blog, create a web page, or use any of the other applications you have found (try to relate to specific applications students have targeted as examples).  You also have time to continue learning the applications you and your group chose. I will ask that you please help one another learn the digital tools you have selected. I will do my best to help you. I am also looking forward to learning the tools you have selected. I appreciate you stretching my digital expertise as well (or some indication that learning is occurring by all).  Allow time for students to respond to the task using the tools and methods they chose to document their learning.  Be prepared to help them consider which tools to use. Provide options for students who are struggling and may need direction for documenting their learning (blog, web page, digital folders or other as appropriate for your situation) | 35 minutes | Students select applications of interest and start documenting work. |
| *Day 2 Clean Up*  Instruct students to clean up. Ask them to submit evidence of submissions: Link to web pages, submissions to digital portfolios.  Note: Be sure to check to make sure students have added something. You will need to provide support for students struggling to get started or for those needing more structure and direction | 1 minute | Students log off computers, submit evidence, and clean up as per directions |
| *Day 2 Closure*  Over the past week we have looked at organizing and managing information in a responsible manner. As we move into our next unit I will ask that you document your learning and educational risk taking using the digital tools you have selected. | 1 minute | Students listen |
| *Day 2 Reflection*  How do I responsibly organize and manage my personal and professional communications?  Have students answer this question/provide evidence using a technology application they selected.  Note: It will be helpful for students if you integrate structured opportunities into lessons that allow students to demonstrate course requirements and competencies | 8 minutes | Students will reflect on essential question using a technology application |

**Teacher’s Comments/Self-Assessment:** (use this space to reflect on what you would do differently, how the lesson unfolded, notes about students, and the like).

**References: (Please update this list annually)**

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Duebel, P. (2018, August 5). *Technology integration: Web page design.* Retrieved from <http://www.ct4me.net/web_page_design.htm#Design%20Resources>

Dyer, K. (2018, January 9). The ultimate list – 65 digital tools and apps to support formative assessment practices.

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Taylor, D. (2016, July 16). APA\_MLA annotated bibliography: Complete guide to writing the annotated bib part 2 [Video file]. Retrieved from <https://www.youtube.com/watch?v=w3A_wEMvnFA>

Taylor, D. (2016, July 16). APA\_MLA annotated bibliography: Complete guide to writing the annotated bib part 3 [Video file]. Retrieved from <https://www.youtube.com/watch?v=USMvfvMszhA&t=9s>

Taylor, D. (2016, July 16). APA\_MLA annotated bibliography: Complete guide to writing the annotated bib part 4 [Video file]. Retrieved from <https://www.youtube.com/watch?v=Zvzw_qPkinQ>

Guerrero, A. (n.d.). 10 TED talks that used visual graphics to win their audience. Retrieved from [**https://www.inc.com/anna-guerrero/10-ted-talks-that-used-visual-graphics-to-win-the-audience.html**](https://www.inc.com/anna-guerrero/10-ted-talks-that-used-visual-graphics-to-win-the-audience.html)

Weebly (2018). Weebly for education. Retrieved from <https://education.weebly.com/>

Zoom (2018). *Zoom* (video conferencing). Retrieved from <https://zoom.us/?zcid=1288&gclid=CjwKCAjwns_bBRBCEiwA7AVGHvKy0fmC6ARy26k4IBFZLqoJVF_24TC5rIhvVsVA4q-xSJ34ROhxwhoCGCAQAvD_BwE>.

**Lesson 14 Resources**

**Using Digital Tools Worksheet**

**Think about the discussions, presentations and activities we have completed in this class as you complete the following activity.**

**With your group please discuss:**

1. What apps/programs did you find that you would like to use to communicate with each other outside of class? (List, discuss, decide – consider using a decision matrix)
2. What apps/programs did you find that you would like to document your project (photos, documents, brainstormed ideas)? (List, discuss, decide-consider using a decision matrix)
3. What apps/programs did you find that you could use for interacting with others outside your class (polls, surveys, free long-distance conferencing)

**As an individual please answer the following:**

1. List at least one thing you have learned this semester. What evidence do you have to show your learning? (List, decide - consider using a decision matrix)
2. Provide one example of an “educational risk” you have taken this semester. What evidence do you have to show you did this? (List, decide – consider using a decision matrix)

**UNIT 4**

**Find & Generate**

### Unit 4 Find & Generate - Notes:

During Unit 4 students will become acquainted with the tools and materials in the lab. The unit is designed to provide an introductory experience with the tools and machines that are available to them. Projects that are introduced during this unit should be short and easy to complete. Learners should get the opportunity to draw and save files in different formats for different machines. Learners should be able to export drawings from CAD programs in the appropriate file format.

This part of the course ties to the “Find and Generate” facets of the Problem Solving Pentagon. Students are exploring what tools and materials they might need to make a viable prototype or final solution for their chosen problem. Students will be documenting their work and identifying successes and failures they had during the unit so the “Organizing and Managing” and “Communicate and Apply” aspects of the problem solving pentagon are also at play. Try to connect what students are doing with the problem solving pentagon when possible.

It is important to emphasize that there will be imperfections in students’ work. This is totally acceptable. Emphasize that most learning occurs from failure (in this instance). Encourage students to try new ideas as they learn to use the machines and materials. While the machines seem to be front and center during this unit, the real lessons come from students understanding material properties and limitations.

Because every lab is different, student and teacher expertise is different, and the problems students focus on vary, it is hard to lay out a specific series of lessons that will work across contexts. This unit will provide some suggestions for ideas but does not dictate what the emphasis should be. This unit relies on the local experts to flesh out and develop the lessons suitable to for the “community context”. You are encouraged to develop your lessons and ideas and submit them to the Northeast Wisconsin Fab CoP at <https://www.curriki.org/groups/northeast-wisconsin-fab-lab/>. A lesson plan template is listed in the Resources section of this unit. Please use that as a guide to developing your resources for submission. Feel free to use and adapt the materials that others have posted there. Make sure to give credit to those you have borrowed from. This Northeast Wisconsin Fab CoP is a resource for you!

**Safety**

Before starting this unit make sure you have an adequate safety program in place. Your plan should meet local, state and federal guidelines. Examples of safety-related items can be found at the Northeast Wisconsin Fab CoP. Please know that the examples in this document and in the Northeast Wisconsin Fab CoP Curriki (NWFC Curriki) are intended as an aid. This author is not responsible for the specific content listed in the NWFC Curriki. The examples in this document and in the NWFC Curriki do not provide a comprehensive safety plan. Just as Russell & Love (2017, *Safer makerspaces, fab labs and STEM labs*) state:

The information (contained in the NWFC Curriki and in this document does not include any) warranty, guarantee, or representation . . . as to the accuracy or sufficiency of the information contained therein. . . . It cannot be assumed that all necessary warning or precautionary measures are contained in this information (pg ix).

Keeping in mind that the instructor is ultimately responsible for the safety of his/her students please consider the following resources:

McKlain, K (2017, July 19). *Safety Poster Template.*  Retrieved from <https://www.curriki.org/oer/Safety-Poster-Template>

McKlain, K. (2017, November 1). Vinyl Cutter Introduction. Retrieved from <https://www.curriki.org/oer/Vinyl-Cutter-Introduction>

Makerspace (Spring, 2013). Makerspace playbook retrieved from: <https://makered.org/wp-content/uploads/2014/09/Makerspace-Playbook-Feb-2013.pdf>.

This resource describes tools and materials, safety, roles, pedagogical practices, examples projects, documenting

Roy, K. R., & Love, T. S. (2017). *Safer makerspaces, fab labs and STEM labs: A collaborative guide!* Vernon, CT: National Safety Consultants LLC. ISBN-13:978-0-692-92408-2

Safety Memos (2014, October 24). What causes accidents – safety training video- preventing accidents & injuries. Retrieved from <https://www.youtube.com/watch?v=dBf6BTX1bmM>

Teach Engineering (2017, May 4). *Hands-on activity: Engineering safety.* Retrieved from <https://www.teachengineering.org/activities/view/usu_safety_activity1>

**Project Ideas & Supplies**

You will need to consider what materials you might need to facilitate your project. For example, cardboard or acrylic may be needed for the laser engraver. Heat transfer vinyl or fabric spray paint may be needed for T-shirt designs. Plastic filament will be needed for the 3D printers.

Fab Foundation (n. d.). *Fab lab inventory.* Retrieved from [https://docs.google.com/spreadsheets/d/1U-jcBWOJEjBT5A0N84IUubtcHKMEM  
tndQPLCkZCkVsU/pub?single=true&gid=0&output=html](https://docs.google.com/spreadsheets/d/1U-jcBWOJEjBT5A0N84IUubtcHKMEMtndQPLCkZCkVsU/pub?single=true&gid=0&output=html). Lists all resources – machines, materials and vendors – found in an MIT Fab Lab

Tiala, S. (2017, July 12). *Resources and suggestions list.* Available at:[*https://www.curriki  
.org/oer/Resources-and-Suggestions-list*](https://www.curriki.org/oer/Resources-and-Suggestions-list)*.*

Scopes-DF (n.d.). K-12 STEM Digital Fabrication: Featured Digital Fabrication Lessons. Retrieved from <https://www.scopesdf.org/>

**Implementation Ideas**

The follow implementation ideas include links to resources developed by NWFC Curriki members who participated in summer workshops and to online resources and tutorials. Drawing resources start the list because drawings are needed as inputs for beginning users in digital manufacturing labs. The list of resources proceeds alphabetically by machine type after that. The last pages include design challenges that were used in workshops. They are examples of assignments that allow students to practice with materials and tools while being short in duration. The final resource in this unit is a lesson plan template. You are encouraged to submit ideas of your own to the NWFC Curriki at <https://www.curriki.org/groups/northeast-wisconsin-fab-lab/>.

**Drawing Resources**

Autodesk (2018). Tinkercad. Retrieved from <https://www.tinkercad.com/>

Autodesk (2018)Tinkercad 3D Design: Step-by-Step Lessons <https://www.tinkercad.com/learn/> about 1 – 50 minute class period to complete

Autodesk (2018). Tinkercad 3D Design: Step-by-Step Lessons [Select: Name That Keychain]. Retrieved from <https://www.tinkercad.com/learn/>

Carlisle, J. (n.d.) *Technical sketching and drawing.* Retrieved from <http://jacquelinecarlisle.weebly.com/2-technical-sketching-and-drawing.html>

Grapa, A. (2018, January 6). Meshmixer & 3D Scanner. Retrieved from <https://www.curriki.org/oer/Meshmixer-and-3D-Scanner>

TheRhinestonWorld (2016, January 2016). *How to convert a picture into a vector image.* Retrieved from <https://www.youtube.com/watch?v=A7NEFWbX0zs>

Votis, A. (2014, Jun 26). Adobe Illustrator Introduction. Retrieved from: <https://www.youtube.com/watch?v=LlVqe-cm73U&feature=youtu.be>

Votis, A. (2016, June 13). Manipulating Text In Adobe Illustrator. Retrieved from <https://www.youtube.com/watch?v=KFD4TzrTdv4>

**CNC Mill Resources**

Tiala, S. (2017, July 12). Building a Bat House – Mystery Project for our July 10 – 14 Workshop <https://www.curriki.org/oer/Mystery-Project-for-our-July-10--14-workshop>

**Electronics/Programing Resources**

Autodesk (2019). Eagle. Retrieved from <https://www.autodesk.com/products/eagle/overview>

Autodesk (2018): Tinkercad for Circuits: Step-by-step lessons. Retrieved from <https://www.tinkercad.com/learn/>

Autodesk (2018): Tinkdercad fro Circuits: Step by-step lessons [click Circuit Design]. Retrieved from <https://www.tinkercad.com/learn/>

Autodesk (2018): Tinkdercad fro Circuits: Step by-step lessons [click Arduino Projects]. Retrieved from <https://www.tinkercad.com/learn/>

Blum, J. (2012, June 14). Tutorial 1 for Eagle: Schematic Design. Retrieved from <https://www.youtube.com/watch?v=1AXwjZoyNno>

Grapa, A. (2018, June 11). Art history lesson plan (featuring scratch programming and using a Makey Makey). Retrieved from <https://www.curriki.org/oer/Art-History-Lesson-Plan--featuring-Scratch-Programing-and-using-a-Makey-Makey->

Sparkfun (n.d.). Alternative Arduino Interfaces. Retrieved from <https://learn.sparkfun.com/tutorials/alternative-arduino-interfaces>

Sparkfun (n.d.) How to Install an Setup EAGLE <https://learn.sparkfun.com/tutorials/how-to-install-and-setup-eagle>

Sparkfun (n.d.) What is Arduino? Retrieved from <https://learn.sparkfun.com/tutorials/what-is-an-arduino>

**Laser Engraver**

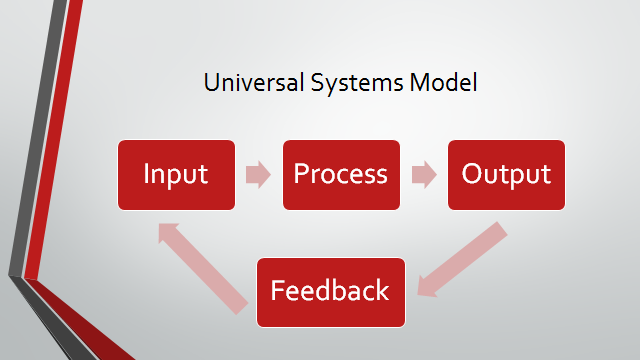
Neuens, A. (2018, June 12). Tesselation Lesson Plan. Retrieved from <https://www.curriki.org/oer/Tessellation-Lesson-Plan/>

**3D Printing**

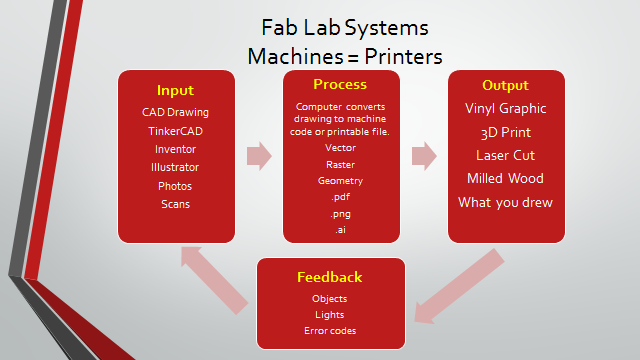
Kroll, T. (2018, July 2). Cookie Cutters. Retrieved from <https://www.curriki.org/oer/Cookie-Cutter>

Jochem, R. (2018, June 19). Creating cell Organelle Models Using the Fab Lab. Retrieved from [https://www.curriki.org/oer/?rid=308074&back\_url=aHR0cHM6Ly93d3cuY3V  
ycmlraS5vcmcvZ3JvdXBzL25vcnRoZWFzdC13aXNjb25zaW4tZmFiLWxhYi9saWJyYXJ5](https://www.curriki.org/oer/?rid=308074&back_url=aHR0cHM6Ly93d3cuY3VycmlraS5vcmcvZ3JvdXBzL25vcnRoZWFzdC13aXNjb25zaW4tZmFiLWxhYi9saWJyYXJ5)

**Orienting Learners**

****

On the first day of the unit it will be helpful to orient learners to the idea that every machine is a printer that is part of a system. If learners can use a word processor and print a document then they can succeed in a digital fabrication laboratory. The basic process is the same. You generate a drawing as an input to a machine. The machine processes the information and outputs a product. Feedback occurs when computers provide error messages or process your part files correctly.

****

Describe how the students will be applying the universal systems model to specific machines. Just as people need a keyboard or mouse to “talk” to a computer, the machines in the lab need an interpreter to talk to the CAD drawings. So people will create a CAD drawing that starts a conversation with a computer. The file is saved in a “language”, or file type that a particular machine can understand. The correct file type is loaded onto a computer that directs the machine how to cut, mill, engrave, and the like.

**Make It! Team Challenge (Vinyl Cutter)**

T-Shirt Logo Design

**Description**:

You are one of several teams working to study bats under the X-ZACT project. While the X-ZACT logo is used for all bat researchers involved in project, it is important to be able to identify members of the smaller team units. Please work with your team members to design a unique logo for your team and print the logo on a personal T-shirt. Be sure to make sure the logos are placed in the same location on all T-shirts for easy recognition. Add an element of personalization to your own T-shirt in addition to the group logo.

**Process:**

* Work with team mates to review the directions and ask questions to clarify the task (Embark & Clarify)
* Brainstorm and sketch ideas. Then share ideas with your team mates (Find & Generate/Communicate).
* Determine which software you will use to make the sketch and who will be responsible for drawing the logo. Figure out how you will distribute files across team members. You may also draw and scan a file. (Organize and Manage/Communicate and Apply)
* Determine how each person will personalize their shirt. (Evaluate and Reflect)
* Select T-Shirt. (Analyze and Synthesize)
* Determine what method you will use to create your shirt (T-Shirt Vinyl or Vinyl stencil with spray paint). (Communicate and Apply)
* Make your own individual T-Shirt (Communicate and Apply)
* Clean up mess. (Organize and Manage)

**Explore**:

Make: 34 Cool Things to Do With Your Vinyl Cutter: <http://makezine.com/2015/12/15/34-things-didnt-realize-can-vinyl-cutter/>

On-skin Interfaces: <https://techcrunch.com/2016/08/12/duoskin/>

Roland Showcase: <https://www.rolanddga.com/gallery>

Roland Applications: <https://www.rolanddga.com/products/vinyl-cutters/camm-1-gs-24-desktop-vinyl-cutter/applications>

**Learning TinkerCAD**

**Teacher(s):** Your name

**Lesson Length**: 2 days

**Background/Context:**

How many of you can use a word processor to type a document? Creating something on a 3D printer is a lot like writing a paper. You use a computer to type a message and then you print it. Today we will do much the same thing. Instead of using a word processor we are going to use a computer-aided drafting program called TinkerCad to draw a keychain. When we are done we will 3D print your keychains.

**Resources and Materials:**

* Computer with access to the internet
* Digital projector

**“I can” Statement**

* I can use an online drafting program to create a 3D object

**Procedure:**

Day 1:

1. Log into TinkerCAD <https://www.tinkercad.com/>
2. Create an account
3. Click on the Learn Tab and select the Step-by-Step lessons - it will take approximately 45 minutes to complete the 6 posted items
4. Can work on 3d printing while learning TinkerCAD

Day 2: Log into your TinkerCAD account

1. Click on the Learn Tab and select the Step-by-Step lessons- select “Name That Keychain” tutorial. Walk through the steps to create a customized keychain

**Assessment:**

* Formative: Students are able to print a 3D keychain
* Summative: Students are able to safely use the 3D printer as part of a final problem-solving project.

**References:**  
Autodesk (2018). Tinkercad. Retrieved from <https://www.tinkercad.com/>

Autodesk (2018)Tinkercad 3D Design: Step-by-Step Lessons <https://www.tinkercad.com/learn/> about 1 – 50 minute class period to complete

Autodesk (2018). Tinkercad 3D Design: Step-by-Step Lessons [Select: Name That Keychain]. Retrieved from <https://www.tinkercad.com/learn/>

**Make It! Challenge – Laser Engraver**

**Name Tag**

**Description**:

Use TinkerCAD or other CAD program to design a name tag with your name. Use the materials provided by the workshop facilitator (acrylic, paint, O-ring) to attach it to a USB stick. Make sure your name tag:

* is not larger than 4” x 4”
* Has a hole placed and sized appropriately to accommodate a USB stick on an O ring

**I can**:

* Draw a shape to be vector cut on the laser
* Demonstrate safe use of the laser engraver
* Draw shape(s) to be rastered on the laser engraver
* Load files into the laser engraver
* Adjust print settings to successfully laser engrave and cut an object
* Demonstrate safe use of the laser engraver
* Clean up the laser engraver and laser engraver area

**Stretch:**

Experiment with other materials using the laser engraver (tile, glass, fabric, wood, etc. – NO VINYL!)

Create handouts for your students to use when using the laser engraver

Other?

**Questions to Explore**:

How do lasers work?

What is the history of the laser engraver glass?

Where might I use a laser engraver to augment my curriculum?

What resources, relative to the laser engraver, might I tap into?

What kinds of careers are associated with lasers and optics?

Others?

**Make It! Challenge (Vinyl Cutter)**

**Personal Labels**

**Description**:

Use a CAD program such as TinkerCAD, to create name labels for your personal possessions

**I can**:

* Create a 2D - .svg file to use on the vinyl cutter
* Demonstrate safe operation of the vinyl cutter
* Load files into the vinyl cutter
* Adjust print settings to successfully cut 2 dimensional objects
* Weed unwanted vinyl from my pattern
* Attach vinyl pattern to secondary objects
* Clean up the vinyl cutter and area around the vinyl cutter

**Stretch:**

Add pictures and other file formats to your vinyl cut out.

Make items connected to your area of expertise

Create handouts for your student to use when they use the vinyl cutter

Other?

**Questions to Explore**:

How do vinyl cutters work?

What is the history of fonts relative to the printing industry?

Where might I use a vinyl cutter to augment my curriculum?

What resources, relative to vinyl cutting might I tap into?

What kinds of careers are associated with vinyl cutting and graphic design?

How might vinyl cutters be used in the performing and visual arts?

How might vinyl cutters be used in industry and manufacturing?

What other applications might vinyl cutting be used for?

What sources, relative to vinyl cutting, might I tap into?

Others?

**Unit 4 Resources**

|  |  |  |  |
| --- | --- | --- | --- |
| **Please consider contributing your ideas to the Northeast Wisconsin Fab CoP at:**  <https://www.curriki.org/groups/northeast-wisconsin-fab-lab/> | | | |
| **Lesson Title** | | | |
| **Contributed by:**  Insert Creative Commons License Here | | | |
|  | | | |
| **Course:** | | | |
| **Lesson Overview:** | | | |
| **Learner/Grade Level:** | | **Estimated Time to Complete:** | |
|  | | | |
| **Purpose:** | | | |
| **Desired Results:**  ***Competencies:***  ***Enduring Understandings:***  ***Essential Questions:*** | | | |
| **Prerequisites:** | | | |
|  | | | |
| **Materials Needed:** | | | |
|  | | | |
| **Key Terms:** | | | |
|  | | | |
| **Learner’s “I Can” Statements:** | | **Links to Standards:** | |
|  | | | |
|  | **Learners Will:** | | **Teacher/Facilitator Will:** |
| **Engage** |  | |  |
| **Explore** |  | |  |
| **Explain** |  | |  |
| **Elaborate** |  | |  |
| **Evaluate** |  | |  |
| **Reflect** |  | |  |
|  | | | |
| **Differentiation:** | | | |
|  | | | |
| **Accommodations:** | | | |
|  | | | |
| **Extension & Enrichment Activities**: | | | |
|  | | | |
| **Resources:** | | | |
|  | | | |
| **Teacher Notes:** | | | |

**Contact Information:**

Name:

Address:

Phone/Fax:

Email:

**Resources used to inform lesson plan template:**

Kansas Association for Conservation & Environmental Education. (2018). *Inquiry, the learning cycle, & the 5E instructional model.* Retrieved from: [http://www.kacee.org/files  
/Inquiry%20&%205E%20Instructional%20Model.pdf](http://www.kacee.org/files/Inquiry%20&%205E%20Instructional%20Model.pdf)

Association for Supervision and Curriculum Development. (2018). *What makes a question essential?*  Retrieved from [http://www.ascd.org/publications/books/109004  
/chapters/What-Makes-a-Question-Essential%A2.aspx](http://www.ascd.org/publications/books/109004/chapters/What-Makes-a-Question-Essential%A2.aspx)

McTighe, J. & Wiggins, G. (2004). *Understanding by design professional development workbook.* Alexandria, VA: Association for Supervision and Curriculum Development .

Schnekser, B. (2017, November 7). *My NASA DATA lesson: human effect.* Retrieved from <https://mynasadata.larc.nasa.gov/lesson-plans/multi-day-lesson-plans/?page_id=474?&passid=116>

**UNIT 5**

**Find & Generate**

### Unit 5 Find & Generate - Notes:

Unit five walks students through the problem solving process. Every team of students may be working on different projects. During this phase of the course, the instructor becomes a facilitator. The facilitator can expect to keep students on track with their problem-solving process; network to find resources (time, money, experts) to help bring projects to fruition; provide formative assessments allowing students to judge their progress.

The semester calendar lays out a tentative schedule for Unit 5. It should be noted that this schedule can vary widely. Different groups may be at different points of the problem solving process at any given time. It is not necessary that everyone be at the same point at the same time but progress does need to be demonstrated. Some of the steps, such as a literature review, may be appropriate for some students while interviews may be important for a different group. Table 1, below, indicates how this unit aligns with elements of the Student Individual Performance (SIP) Rubric. For example, the teacher/facilitator would allow two to three days for students to identify the “Who, What, Where, Why?” of the problem they were tackling. The students have already used a decision matrix to pick their problem. This decision matrix should be refined and updated. Students would select how they would document their work. The teacher would use the “Examine context and define problem” and the “Develop, clarify & negotiate constraints and criteria” section of the SIP rubric to provide feedback. Students would have the opportunity to revise their work. Teacher can provide feedback helping students improve. Theoretically, this will lead to students displaying “Proficient” or “Expert” work as they revise their documentation. The cycle repeats as students and facilitators move through the design process. The idea of this method is to encourage students to take appropriate educational risks and fully engage in the problem solving process. The idea is that all students will demonstrate a high level of problem-solving proficiency by the end of the semester since practice and repeats are allowed.

**Table 1: Course calendar aligned with Student Individual Performance Rubric**

|  |  |
| --- | --- |
| **Unit 5 Assignments from course calendar** | **Formative Assessment from**  **Student Individual Performance Rubric** |
| Clarify and refine problem | Examine context and define problem  Develop, clarify & negotiate constraints and criteria |
| Evaluating sources – Internet & Interviews | Conduct research/gather pertinent information |
| Brainstorming solutions | Generate and visualize possible solutions  Select a design solution |
| Working toward problem solution  Require students to document their design process. | Select a design solution  Plan & communicate design |
| Working toward problem solution  Prototype the solution | Select and use resources  Develop a plan for producing a model/prototype |
| Working toward problem solution  Solution feedback | Produce the model prototype  Test and critique the solution |
| Working toward problem solution  Require students to document their design process. | Refine the solution  Documentation/Technical Reporting |

The Group Evaluation Rubric should be distributed to teams of students at several points during the semester. Consider adapting it to provide feedback to individual students. Allow peer assessment as well as teacher assessment of group members. Students are able to use this feedback to inform and document their learning growth and educational risk taking.

**Unit 5 Resources**

# Student Individual Performance Rubric

Used with permission from Dr. R. Custer email on 22 June, 2018: rodney.custer@bhsu.edu

Custer, R., Valesey, B., Burke, B. (2001). An assessment model for a design approach to technological problem solving. *Journal of Technology Education, 12*(2). doi <https://doi.org/10.21061/jte.v12i2.a.1>

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Problem & Design Clarification** | | | | | |
|  | Expert | Proficient | Competent | Beginner | Novice |
| Examine context & define problem | Poses pertinent questions for clarification.  Identifies and prioritizes sub-problems (within the larger problem).  Explores context. | Poses questions.  Identifies sub-problems but does not prioritize.  Ignores context. | Asks some pertinent questions.  Identifies key content.  Defines problem adequately.  Ignores context. | Expresses limited knowledge of context or problem; problem is defined but needs clarification.  Asks questions but not pertinent and too few.  Ignores context.  Exhibits some indifference or frustration. | Tends to hone in on wrong problem, isolated subset, or easiest part to solve.  Begins to solve without clarification or questions.  Doesn’t see context.  Exhibits considerable indifference or frustration. |
| Develop, clarify, & negotiate constraints and criteria | Explains key constraints in detail.  Tries to negotiate or circumvent constraints.  Clarifies criteria prior to solving problem or posing solutions. | Clarifies constraints in detail; expresses their relationship to the problem solution.  Engages in limited negotiation of the constraints. | Clarifies constraints and accepts them as presented and understood. | Recognizes constraints but seeks minimal clarification. Accepts constraints as is.  Clarifies constraints late in design process as failures occur. | Does not identify constraints or criteria; does not grasp the significance of constraints.  Sees constraints as insignificant. |
| **Problem & Design Clarification (Continued)** | | | | | |
|  | Expert | Proficient | Competent | Beginner | Novice |
| Conduct research/ gather pertinent information | Consults several key sources.  Evaluates information; relates information back to problem and constraints.  Uses refined search strategies.  Researches sub-problems | Consults several key sources.  Uses observational techniques.  Cites references.  Ignores sub-problems. | Uses search guides and locates at least 2 sources.  Consults sources with some direction and/or organization. | Conducts very limited research.  Search restricted to easy-to- find and readily available resources. | Does not conduct research nor consult sources.  Starts solving problem without information. |
| **Develop a Design** | | | | | |
|  | Expert | Proficient | Competent | Beginner | Novice |
| Generate and visualize possible solutions | Generates creative and efficient solutions.  All solutions meet constraints and address the original problem.  Able to generate a number of different solutions.  Is innovative | Generates feasible solutions, but many are similar.  Meets constraints.  Uses resources efficiently.  Proposes creative solutions. Thinks “inside of the box”. | Generates solutions that meet most of constraints.  Establishes resources needed to implement solution.  Generates several possible solutions within constraints.  Thinks “inside the box.” | Identifies solutions that meet some of the constraints.  Some solutions are adequate to solve the problem.  Solutions may/may not be feasible.  Identifies single solution that meets constraints. | Cannot identify solutions *or* solutions are inappropriate to framed problem.  Does not appear to have an idea of where to begin.  Solutions are disconnected from, or totally ignore, constraints. |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Develop a Design (Continued)** | | | | | |
|  | Expert | Proficient | Competent | Beginner | Novice |
| Select a design solution | Provides detailed reasons for selecting solution.  Provides backup or alternate solution in case the first solution fails.  Attempts to be innovative and wants best possible solution.  Self-assured. | Selects solution on basis of efficiency and effectiveness.  Checks against constraints.  Provides basic rationale for selection.  Tends not to have an alternative solution in case the initial choice does not work. | Selects a reasonable solution based on criteria.  Solution meets constraints. | Selects solution with limited attention to criteria.  Can select solution.  Solution may or may not be feasible.  Is tentative and insecure in the selection process. | Selects solution according to personal preferences.  Unable to decide solution.  Solution may be unrealistic or impractical.  Uses few if any criteria to evaluate solutions.  Solution represents an easy way out. |
| Plan & communicate design | Develops detailed design plan, drawings, and sketches.  Devotes careful attention to constraints.  Continuously revisits and refines the solution.  Knows when to stop the refinement process. | Creates a plan with supporting technical drawings.  Maintains journal or log of daily activities.  Meets constraints. | Creates an organized plan with sufficient detail. Identifies basic tools, resources.  Visualizes using technical drawings.  Ignores some constraints. | Explains design plan, citing procedures, resources, and other requirements.  Visualizes using technical sketches without regard for scale.  Ignores key constraints. | Explains design in general terms and with little detail.  Sketches are rough and without sufficient detail. May attempt to move forward without drawings.  Ignores constraints. |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Model/Prototype** | | | | | |
|  | Expert | Proficient | Competent | Beginner | Novice |
| Select and use resources | Uses appropriate resources (i.e. tools, materials, and information) for developing and producing the solution.  Accesses a variety of information sources (websites, manuals, technicians, electronic catalogs, etc.).  Selects and adeptly uses resources. | Accesses and uses appropriate resources to solve the problem.  Exhibits  refined knowledge of tools, materials, and technological processes.  Uses resources confidently. | Selects and uses appropriate resources related to most aspects of the problem. Displays some difficulty in accessing information.  Selects appropriate tools for developing and producing the solution.  Search for resources is limited to few sources. | Selects a limited range of resources.  Some difficulty in choosing appropriate technological resources.  Needs guidance in safe use of resources. | Limited ability to select and use basic resources.  Selection of tools, materials, processes, and information may be inappropriate.  Selected resources may not be feasible due to lack of availability, need for expertise, or cost. |
| Develop a plan for producing a model/ prototype | Develops a well detailed plan with references to design constraints and criteria.  Includes testing and modification steps.  Incorporates quality control measures. | Develops a detailed and systematic plan.  Communicates information and processes needed to produce the model or prototype.  Incorporates testing as a procedural step. | Develops a plan with logical and sufficient steps to develop and produce a solution.  Plan needs quality control checkpoints. | Develops a plan with some gaps and insufficient steps to solve the problem.  Connection with design criteria and constraints is marginal. | Develops a plan that lacks coherence and departs from design constraints and criteria.  Plan contains gaps and does not flow logically.  Procedures lack necessary detail. |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Model/Prototype (Continued)** | | | | | | | | | |
|  | Expert | | | Proficient | | Competent | | Beginner | Novice |
| Produce model/  prototype | Is adept with tools and resources, making continual adjustments to "tweak" the model/prototype.  Demonstrates persistence with minor problems.  Enjoys the challenge of refinements. | | | Uses tools and resources without guidance.  Refines model to enhance appearance and capabilities. | | Uses tools and resources with little or no guidance.  May redo model/prototype parts to improve quality. | | Uses tools and resources with some guidance.  May have difficulty selecting appropriate resources.  Refines work, but may prefer to leave model as first produced. | Needs guidance in order to use resources safely and appropriately.  Crudely constructs model/prototype, with little or no refinement. |
| **Evaluate the Design Solution** | | | | | | | | | |
|  | | Expert | Proficient | | Competent | | Beginner | | Novice |
| Test and critique solution | | The solution fully meets the design constraints and criteria.  Specific improvement ideas are generated and documented. | The solution meets most of the design constraints and criteria.  Some general improvement ideas are generated and documented. | | The solution addresses some design criteria completely but ignores others.  Recognizes the need for improvement. Some ideas are generated, however only in concept.  Documentation is sketchy. | | The solution is only marginally connected with the design criteria.  Shows little interest in improving the solution. | | The solution fails to meet selected design criteria.  In spite of problems detected during testing, no effort is made to refine the solution. |
| **Evaluate the Design Solution (Continued)** | | | | | | | | | |
|  | | Expert | Proficient | | Competent | | Beginner | | Novice |
| Refine solution | | Solution is refined in a manner consistent with constraints and criteria.  Solution is in constant refinement, based on continuous data gathering. | Solution is refined in a manner consistent with constraints.  Changes represent some improvement to the quality and functionality of the solution. | | Solution is refined to be consistent with design constraints and criteria.  Refinements may be cosmetic and may not be significant. | | Some minor refinement of the original solution.  Refinements are primarily cosmetic in nature and contribute only marginally to the quality or effectiveness of the solution. | | Solution is accepted "as is".  Criteria and constraints are not referenced.  No data is collected to evaluate the solution. |
| Documentation/Technical Reporting | | All aspects of the design process are well-documented, including the processes used, design details, and resources.  Documentation package is well organized, highly reflective, technically accurate, and communicates effectively to others. | The design process is documented including the processes used, design details, and resources.  Drawings are technical and provide essential information  Documentation is fairly organized. Some insights concerning design changes and refinements are detailed. | | Documentation of design processes are factual and include all components.  Drawings are technical and provide essential information.  Reflections are limited to facts, with limited depth. | | Some attention to documentation with a preference for graphically depicting the design.  Little evidence of a clear organizational scheme.  Some design stages may not be documented. | | Little documentation is done of either the product design or of the design process.  Documentation is limited to hand-drawn sketches and sketchy, handwritten notes. |

**Group Evaluation Rubric**

**Name:**

Custer, R., Valesey, B., Burke, B. (2001). An assessment model for a design approach to technological problem solving. *Journal of Technology Education, 12*(2). doi <https://doi.org/10.21061/jte.v12i2.a.1> Permission for use obtained from Dr. R. Custer 22 July, 2018 ([Rodney.Custer@bhsu.edu](mailto:Rodney.Custer@bhsu.edu))

|  |  |
| --- | --- |
| All members of the group contributed actively to the process | 5 4 3 2 1 |
| The members achieved an appropriate balance between leadership and followership | 5 4 3 2 1 |
| All members contributed creative ideas to the process | 5 4 3 2 1 |
| The group was able to re-energize when the energy level dropped off | 5 4 3 2 1 |
| The group was able to critique its own work | 5 4 3 2 1 |
| There was a good balance between group and individual work | 5 4 3 2 1 |
| As a whole, the group was flexible and adaptable | 5 4 3 2 1 |
| The group generated many new ideas rather than prematurely selecting a single solution | 5 4 3 2 1 |
| The group was able to incorporate diverse personalities and ideas | 5 4 3 2 1 |
| The group had the ability to resolve adversity (ideas that didn’t work, frustration, etc.) | 5 4 3 2 1 |

# 5 – Absolutely true of this group

**4 – Described the group for the most part**

**3 – Description fit the group about half of the time**

**2 – Only marginally describes the group**

**1 – Does not describe the group at all**

**UNIT 8**

**Analyze & Synthesize**

**Unit 8 Analyze & Synthesize – Notes:**

**Summative Assessment:**

Students’ summative assessment in the course consists of 5 separate assessment tools that make up 70 percent of their grade. This includes:

* Student Individual Performance Rubric
* Group Evaluation Rubric
* Intolerance of Uncertainty Rubric
* Heppner & Petersen’s Problem Solving Inventory
* Denson, Buelin, Lammi, & D’Amico’s assessment for creativity in . . . design

Preparation for most of the assessments is straight forward as they can be provided to students in hard copy or in a course management system. All but one of the assessments was given as a pre-test at the beginning of the course. Procedures for administrating the assessments should follow a pattern similar to that in the introductory unit.

The Denson, Buelin, Lammi, and D’ Amico assessment will take planning. Their assessment requires that:

1. Students have prepared and posted a 5 minute video summing up their work
2. Course instructors have recruited several outside evaluators to judge the portfolios
3. Course instructors need to generate the assessment tool for reviwers
4. Portfolios need to be posted to an appropriate site where evaluators can review student work.
5. Evaluators need to complete their portfolio reviews in a timely manner.

**Ties to the Problem Solving Pentagon**

Students should be informed that the final assessment ties into the “analyze and synthesize” portion of the problem solving pentagon as well as the “communicate and application portion of the problem solving pentagon”. Students and instructors should take time to reflect on the problem solving journey and the supporting frameworks that informed the process.

**Reflection Process**

The final assessment process takes place over the course of 4 days. It involves teachers, students and outsider reviewers as follows:

Day 1:

* + Students post a final 5 minute digital presentation documenting their problem solution
  + Students assess themselves on their learning growth, digital literacy & educational risk taking
  + Teachers do a summative evaluation of student problem solving using Student Individual Performance Rubric and the Group Evaluation Rubric

Day 2:

* External reviewers assess student digital presentations using Denson, Buelin, Lammi, & D’Amico’s assessment for creativity in . . . design
* Students take the post course Intolerance of Uncertainty Rubric and Heppner & Petersen’s Problem Solving Inventory
  + Scoring of assessments is done by the next day.

Day 3:

* Teachers hand back assessments from the beginning of the semester
* Students see the results of their pre- and post- assessments.
* Students make a final post to their documentation reflecting on their growth

Day 4:

* Teachers and students discuss course improvement
* Teachers and students discuss their semester-long learning journey

|  |
| --- |
|  |

**References:**

Carleton, R. N., Norton, M. A., & Asmundson, G. J. G. (2007). Fearing the unknown: A short version of the intolerance of uncertainty scale. *Journal of Anxiety Disorders (21)*1, 105-117. doi: S0887-6185(06)00051-X [pii]10.1016/j.janxdis.2006.03.014

Custer, R., Valesey, B., Burke, B. (2001). An assessment model for a design approach to technological problem solving. *Journal of Technology Education, 12*(2). doi <https://doi.org/10.21061/jte.v12i2.a.1>

Dekkers, L. M. S., Jansen, B. R. J., Salemink, E., Huizenga, H. M. (2017). Intolerance of uncertainty scale: Measurement invariance among adolescent boys and girls and relationships with anxiety and risk taking. *Journal of Behavior Therapy and Experimental Psychiatry, 55*, 57-65.

Denson, C. D. , Buelin, J. K. Lammi, M. D., & D’Amico, S. (2015, Fall). Developing instrumentation for assessing creativity in engineering design. Journal of Technology Education 27(1), pp 23-40. Retrieved from <https://eric.ed.gov/?id=EJ1087892>.

Heppner, P. P. & Heppner, M. J, Ferrari, L, Cieno, P, Y Picotti, M. (2011, September). Helping people navigate their careers through problem solving. Retrieved from <http://larios.psy.unipd.it/conference2011/materials/12/problem_solving_symposium.pdf>.

Heppner, P. P., & Petersen, C. H. (1982). The development and implications of a personal problem-solving inventory. *Journal of Counseling Psychology, 29*(1), 66-75. [doi:10.1037/0022-0167.29.1.66](https://doi.org/10.1037/0022-0167.29.1.66)

MindTools (n. d.) *How good is your problem solving?* Retrieved from <https://www.mindtools.com/pages/article/newTMC_72.htm>

**Unit 8 Resources**

**Course Assessments – Used with Permission from the Authors**

**See Individual Items for Permissions**

# Student Individual Performance Rubric

Used with permission from Dr. R. Custer email on 22 June, 2018: rodney.custer@bhsu.edu

Custer, R., Valesey, B., Burke, B. (2001). An assessment model for a design approach to technological problem solving. *Journal of Technology Education, 12*(2). doi <https://doi.org/10.21061/jte.v12i2.a.1>

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Problem & Design Clarification** | | | | | |
|  | Expert | Proficient | Competent | Beginner | Novice |
| Examine context & define problem | Poses pertinent questions for clarification.  Identifies and prioritizes sub-problems (within the larger problem).  Explores context. | Poses questions.  Identifies sub-problems but does not prioritize.  Ignores context. | Asks some pertinent questions.  Identifies key content.  Defines problem adequately.  Ignores context. | Expresses limited knowledge of context or problem; problem is defined but needs clarification.  Asks questions but not pertinent and too few.  Ignores context.  Exhibits some indifference or frustration. | Tends to hone in on wrong problem, isolated subset, or easiest part to solve.  Begins to solve without clarification or questions.  Doesn’t see context.  Exhibits considerable indifference or frustration. |
| Develop, clarify, & negotiate constraints and criteria | Explains key constraints in detail.  Tries to negotiate or circumvent constraints.  Clarifies criteria prior to solving problem or posing solutions. | Clarifies constraints in detail; expresses their relationship to the problem solution.  Engages in limited negotiation of the constraints. | Clarifies constraints and accepts them as presented and understood. | Recognizes constraints but seeks minimal clarification. Accepts constraints as is.  Clarifies constraints late in design process as failures occur. | Does not identify constraints or criteria; does not grasp the significance of constraints.  Sees constraints as insignificant. |
| **Problem & Design Clarification (Continued)** | | | | | |
|  | Expert | Proficient | Competent | Beginner | Novice |
| Conduct research/ gather pertinent information | Consults several key sources.  Evaluates information; relates information back to problem and constraints.  Uses refined search strategies.  Researches sub-problems | Consults several key sources.  Uses observational techniques.  Cites references.  Ignores sub-problems. | Uses search guides and locates at least 2 sources.  Consults sources with some direction and/or organization. | Conducts very limited research.  Search restricted to easy-to- find and readily available resources. | Does not conduct research nor consult sources.  Starts solving problem without information. |
| **Develop a Design** | | | | | |
|  | Expert | Proficient | Competent | Beginner | Novice |
| Generate and visualize possible solutions | Generates creative and efficient solutions.  All solutions meet constraints and address the original problem.  Able to generate a number of different solutions.  Is innovative | Generates feasible solutions, but many are similar.  Meets constraints.  Uses resources efficiently.  Proposes creative solutions. Thinks “inside of the box”. | Generates solutions that meet most of constraints.  Establishes resources needed to implement solution.  Generates several possible solutions within constraints.  Thinks “inside the box.” | Identifies solutions that meet some of the constraints.  Some solutions are adequate to solve the problem.  Solutions may/may not be feasible.  Identifies single solution that meets constraints. | Cannot identify solutions *or* solutions are inappropriate to framed problem.  Does not appear to have an idea of where to begin.  Solutions are disconnected from, or totally ignore, constraints. |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Develop a Design (Continued)** | | | | | |
|  | Expert | Proficient | Competent | Beginner | Novice |
| Select a design solution | Provides detailed reasons for selecting solution.  Provides backup or alternate solution in case the first solution fails.  Attempts to be innovative and wants best possible solution.  Self-assured. | Selects solution on basis of efficiency and effectiveness.  Checks against constraints.  Provides basic rationale for selection.  Tends not to have an alternative solution in case the initial choice does not work. | Selects a reasonable solution based on criteria.  Solution meets constraints. | Selects solution with limited attention to criteria.  Can select solution.  Solution may or may not be feasible.  Is tentative and insecure in the selection process. | Selects solution according to personal preferences.  Unable to decide solution.  Solution may be unrealistic or impractical.  Uses few if any criteria to evaluate solutions.  Solution represents an easy way out. |
| Plan & communicate design | Develops detailed design plan, drawings, and sketches.  Devotes careful attention to constraints.  Continuously revisits and refines the solution.  Knows when to stop the refinement process. | Creates a plan with supporting technical drawings.  Maintains journal or log of daily activities.  Meets constraints. | Creates an organized plan with sufficient detail. Identifies basic tools, resources.  Visualizes using technical drawings.  Ignores some constraints. | Explains design plan, citing procedures, resources, and other requirements.  Visualizes using technical sketches without regard for scale.  Ignores key constraints. | Explains design in general terms and with little detail.  Sketches are rough and without sufficient detail. May attempt to move forward without drawings.  Ignores constraints. |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Model/Prototype** | | | | | |
|  | Expert | Proficient | Competent | Beginner | Novice |
| Select and use resources | Uses appropriate resources (i.e. tools, materials, and information) for developing and producing the solution.  Accesses a variety of information sources (websites, manuals, technicians, electronic catalogs, etc.).  Selects and adeptly uses resources. | Accesses and uses appropriate resources to solve the problem.  Exhibits  refined knowledge of tools, materials, and technological processes.  Uses resources confidently. | Selects and uses appropriate resources related to most aspects of the problem. Displays some difficulty in accessing information.  Selects appropriate tools for developing and producing the solution.  Search for resources is limited to few sources. | Selects a limited range of resources.  Some difficulty in choosing appropriate technological resources.  Needs guidance in safe use of resources. | Limited ability to select and use basic resources.  Selection of tools, materials, processes, and information may be inappropriate.  Selected resources may not be feasible due to lack of availability, need for expertise, or cost. |
| Develop a plan for producing a model/ prototype | Develops a well detailed plan with references to design constraints and criteria.  Includes testing and modification steps.  Incorporates quality control measures. | Develops a detailed and systematic plan.  Communicates information and processes needed to produce the model or prototype.  Incorporates testing as a procedural step. | Develops a plan with logical and sufficient steps to develop and produce a solution.  Plan needs quality control checkpoints. | Develops a plan with some gaps and insufficient steps to solve the problem.  Connection with design criteria and constraints is marginal. | Develops a plan that lacks coherence and departs from design constraints and criteria.  Plan contains gaps and does not flow logically.  Procedures lack necessary detail. |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Model/Prototype (Continued)** | | | | | | | | | |
|  | Expert | | | Proficient | | Competent | | Beginner | Novice |
| Produce model/  prototype | Is adept with tools and resources, making continual adjustments to "tweak" the model/prototype.  Demonstrates persistence with minor problems.  Enjoys the challenge of refinements. | | | Uses tools and resources without guidance.  Refines model to enhance appearance and capabilities. | | Uses tools and resources with little or no guidance.  May redo model/prototype parts to improve quality. | | Uses tools and resources with some guidance.  May have difficulty selecting appropriate resources.  Refines work, but may prefer to leave model as first produced. | Needs guidance in order to use resources safely and appropriately.  Crudely constructs model/prototype, with little or no refinement. |
| **Evaluate the Design Solution** | | | | | | | | | |
|  | | Expert | Proficient | | Competent | | Beginner | | Novice |
| Test and critique solution | | The solution fully meets the design constraints and criteria.  Specific improvement ideas are generated and documented. | The solution meets most of the design constraints and criteria.  Some general improvement ideas are generated and documented. | | The solution addresses some design criteria completely but ignores others.  Recognizes the need for improvement. Some ideas are generated, however only in concept.  Documentation is sketchy. | | The solution is only marginally connected with the design criteria.  Shows little interest in improving the solution. | | The solution fails to meet selected design criteria.  In spite of problems detected during testing, no effort is made to refine the solution. |
| **Evaluate the Design Solution (Continued)** | | | | | | | | | |
|  | | Expert | Proficient | | Competent | | Beginner | | Novice |
| Refine solution | | Solution is refined in a manner consistent with constraints and criteria.  Solution is in constant refinement, based on continuous data gathering. | Solution is refined in a manner consistent with constraints.  Changes represent some improvement to the quality and functionality of the solution. | | Solution is refined to be consistent with design constraints and criteria.  Refinements may be cosmetic and may not be significant. | | Some minor refinement of the original solution.  Refinements are primarily cosmetic in nature and contribute only marginally to the quality or effectiveness of the solution. | | Solution is accepted "as is".  Criteria and constraints are not referenced.  No data is collected to evaluate the solution. |
| Documentation/Technical Reporting | | All aspects of the design process are well-documented, including the processes used, design details, and resources.  Documentation package is well organized, highly reflective, technically accurate, and communicates effectively to others. | The design process is documented including the processes used, design details, and resources.  Drawings are technical and provide essential information  Documentation is fairly organized. Some insights concerning design changes and refinements are detailed. | | Documentation of design processes are factual and include all components.  Drawings are technical and provide essential information.  Reflections are limited to facts, with limited depth. | | Some attention to documentation with a preference for graphically depicting the design.  Little evidence of a clear organizational scheme.  Some design stages may not be documented. | | Little documentation is done of either the product design or of the design process.  Documentation is limited to hand-drawn sketches and sketchy, handwritten notes. |

**Group Evaluation Rubric**

**Name:**

Custer, R., Valesey, B., Burke, B. (2001). An assessment model for a design approach to technological problem solving. *Journal of Technology Education, 12*(2). doi <https://doi.org/10.21061/jte.v12i2.a.1> Permission for use obtained from Dr. R. Custer 22 July, 2018 ([Rodney.Custer@bhsu.edu](mailto:Rodney.Custer@bhsu.edu))

|  |  |
| --- | --- |
| All members of the group contributed actively to the process | 5 4 3 2 1 |
| The members achieved an appropriate balance between leadership and followership | 5 4 3 2 1 |
| All members contributed creative ideas to the process | 5 4 3 2 1 |
| The group was able to re-energize when the energy level dropped off | 5 4 3 2 1 |
| The group was able to critique its own work | 5 4 3 2 1 |
| There was a good balance between group and individual work | 5 4 3 2 1 |
| As a whole, the group was flexible and adaptable | 5 4 3 2 1 |
| The group generated many new ideas rather than prematurely selecting a single solution | 5 4 3 2 1 |
| The group was able to incorporate diverse personalities and ideas | 5 4 3 2 1 |
| The group had the ability to resolve adversity (ideas that didn’t work, frustration, etc.) | 5 4 3 2 1 |

# 5 – Absolutely true of this group

**4 – Described the group for the most part**

**3 – Description fit the group about half of the time**

**2 – Only marginally describes the group**

**1 – Does not describe the group at all**

Intolerance of Uncertainty Scale – Short Form (IUS-12)

The intolerance of Uncertainty Scale – Short From (IUS-12) will be administered as a pre-test at the beginning of the semester and again at the end of the semester. It is hypothesized that students who do not tolerate uncertainty well are less likely to take risks related to problem-solving and innovation. Teachers may want to use the measure to explore if class activities in problem solving changed students attitudes or if an intolerance of uncertainty may have had an impact on student learning.

The assessment, shown below, can be retrieved from: <http://www.midss.org/content/intolerance-uncertainty-scale-short-form-ius-12>



Carleton, R. N., Norton, M. A., & Asmundson, G. J. G. (2007). Fearing the unknown: A short version of the intolerance of uncertainty scale. Journal of Anxiety Disorders, 21, 105-117. doi: S0887-6185(06)00051-X [pii]10.1016/j.janxdis.2006.03.014 Retrieved from: <http://www.midss.org/content/intolerance-uncertainty-scale-short-form-ius-12>

All of the instruments submitted to the MIDSS are protected under the Creative Commons attribution non-commercial 3.0 license. The instrument cannot be used for commercial purposes without the author’s consent.

Intolerance of Uncertainty Scale – Scoring

**Prospective Anxiety: fear and anxiety based on future events**

Score

Item 1 \_\_\_\_\_\_\_

Item 2 \_\_\_\_\_\_\_

Item 4 \_\_\_\_\_\_\_

Item 5 \_\_\_\_\_\_\_

Item 8 \_\_\_\_\_\_\_

Item 9 \_\_\_\_\_\_\_

Item 11 \_\_\_\_\_\_\_

Total: \_\_\_\_\_\_\_\_

**Inhibitory Anxiety: uncertainty inhibiting action or experience**

Score

Item 3 \_\_\_\_\_\_\_

Item 6 \_\_\_\_\_\_\_

Item 7 \_\_\_\_\_\_\_

Item 10 \_\_\_\_\_\_\_

Item 12 \_\_\_\_\_\_\_

Total: \_\_\_\_\_\_\_\_

See the following article for scale and scoring development:

Carleton, R. N., Norton, M. A. P. J., Asmundson, G. J. G. (2007). Fearing the unknown: A short version of the intolerance of uncertainty scale. *Journal of Anxiety Disorders 21*(1), 105-117.

**Heppner & Peterson’s Problem Solving Inventory**

This inventory can be used as a pre- and post- problem solving inventory. Please obtain permission to use the inventory in your classroom. Permission was granted by the author to use the assessment in this document. Permission was granted to reproduce the assessment from the APA for a term of one year. If the instrument has been removed from electronic access, please use the following information to obtain the questions used in this problem solving inventory.

Directions for using Heppner & Peterson’s Problem Solving Inventory:

1. Gain access to Heppner & Peterson’s article through your local library/online. Heppner, P. P., & Petersen, C. H. (1982). The development and implications of a personal problem-solving inventory. *Journal of Counseling Psychology, 29*(1), 66-75. [doi:10.1037/0022-0167.29.1.66](https://doi.org/10.1037/0022-0167.29.1.66)
2. Refer to Table 1 for the questions used in the inventory.
3. Use the permissions area of the *Journal of Counseling Psychology* to request permission to use the assessment tool.
4. Seek permission to use the inventory and alter the introduction from Dr. P. Paul Heppner at [heppnerp@missouri.edu](mailto:heppnerp@missouri.edu)
5. Write an introductory paragraph introducing the assessment in the context which you are using the inventory.
6. Construct the inventory using a word processor or online testing site as per permission from the APA.

Dr. P Paul Heppner can be contacted at: [heppnerp@missouri.edu](mailto:heppnerp@missouri.edu)

# The Problem Solving Inventory

## Form B

P. Paul Heppner, Ph.D.

Used with permission of author 26 June, 2018

Note, the directions have been modified from the original format

**Directions:**  People respond to problems in different ways.  The statements on this inventory deal with how people react to problems in their day-to-day life.  The term “problems” refers to technical and creative problem solving that everyone experiences at times, such as having a car that won’t start, accessing the internet with browsers that don’t work, charging electronic devices when travelling, or learning how to work with new materials like fabric or clay.  Please respond to the items as honestly as possible so as to most accurately portray how you handle such technical problems. Your responses should reflect what you actually do to solve problems, not how you think you should solve them.  When you read an item, ask yourself: Do I ever behave this way? Please answer every item.

Read each statement and indicate the extent to which you agree or disagree with that statement, using the scale provided.  Mark your responses by circling the number to the right of each statement.

* + 1. Strongly Agree
    2. Moderately Agree
    3. Slightly Agree
    4. Slightly Disagree
    5. Moderately Disagree
    6. Strongly Disagree

1. When a solution to a problem has failed, I do not examine why it didn’t work.

1. When I am confronted with a complex problem, I don’t take the time to develop a strategy for collecting information that will help define the nature of the problem.
2. When my first efforts to solve a problem fail, I become uneasy about my ability to handle the situation.
3. After I solve a problem, I do not analyze what went right and what went wrong.
4. I am usually able to think of creative and effective alternatives to my problems.
5. After following a course of action to solve a problem, I compare the actual outcome with the one I had anticipated.
6. When I have a problem, I think of as many possible ways to handle it as I can until I can’t come up with any more ideas.
7. When confronted with a problem, I consistently examine my feelings to find out what is going on in a problem situation.
8. When confused about a problem, I don’t clarify vague ideas or feeling by thinking of them in concrete terms.
9. I have the ability to solve most problems even though initially no solution is immediately apparent.
10. Many of the problems I face are too complex for me to solve
11. When solving a problem, I make decisions that I am happy with later.
12. When confronted with a problem, I tend to do the first thing that I can think of to solve it.
13. Sometimes I do not stop and take time to deal with my problems, but just kind of muddle ahead.
14. When considering solutions to a problem, I do not take the time to assess the potential success of each alternative.
15. When confronted with a problem, I stop and think about it before deciding on a next step.
16. I generally act on the first ideal that comes to mind in solving a problem.
17. When making a decision, I compare alternatives and weigh the consequences of one against the other.
18. When I make plans to solve a problem, I am almost certain that I can make them work.
19. I try to predict the result of a particular course of action.
20. When I try to think of possible solutions to a problem, I do not come up with very many alternatives.
21. When trying to solve a problem, one strategy I often use is to think of past problems that have been similar.
22. Given enough time and effort, I believe I can solve most problems that confront me.
23. When faced with a novel situation, I have confidence that I can handle problems that may arise.
24. Even though I work on a problem, sometimes I feel like I’m groping or wandering and not getting down to the real issue.
25. I make snap judgements and later regret them.
26. I trust my ability to solve new and difficult problems.
27. I use a systematic method to compare alternatives and make decisions.
28. When thinking of ways to handle a problem, I seldom combine ideas from various alternatives to arrive at a workable solution.
29. When faced with a problem, I seldom assess the external forces that may be contributing to the problem.
30. When confronted with a problem, I usually first survey the situation to determine the relevant information.
31. There are times when I become so emotionally charged that I can no longer see the alternatives for solving a particular problem.
32. After making a decision, the actual outcome is usually similar to what I had anticipated.
33. When confronted with a problem, I am unsure of whether I can handle the situation.
34. When I become aware of a problem, one of the first things I do is try to find out exactly what the problem is.

PSI SELF-SCORING SHEET

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Instructions:

Scoring the PSI is a matter of summing the responses to each item (1-6) for each of the three factors. The times constituting each factor are listed below.

1. The first step is to transfer your answers (1-6) for the inventory to each of the corresponding blanks on this scoring sheet.
2. Second, note that some items are worded negatively, and scoring of these items must be reversed. These items are indicated by asterisks, and are followed by an equal sign (=) and an additional blank. Thus, for these items, reverse the numbers in the following fashion on all of those items which have additional blanks.

1 = 6

2 = 5

3 = 4

4 = 3

5 = 2

6 = 1

1. Third, simply sum the responses together for each factor (being careful to add any reversed number). Record the factor score.
2. Finally, add the three factor scores for the PSI total score. Do not add the three filler items in any way.

Self-Scoring the PSI

Factor one: Problem Solving Confidence

5. \_\_\_\_\_ 24. \_\_\_\_\_

10. \_\_\_\_\_ 27. \_\_\_\_\_

11.\* \_\_\_\_\_ = \_\_\_\_\_ 33. \_\_\_\_\_

12. \_\_\_\_\_ 34.\* \_\_\_\_\_ = \_\_\_\_\_

19. \_\_\_\_\_ 35. \_\_\_\_\_

1. \_\_\_\_\_

# FACTOR 1 SCORE \_\_\_\_\_

# Factor two: Approach-Avoidance Style

1.\* \_\_\_\_\_ = \_\_\_\_\_ 16. \_\_\_\_\_

2.\* \_\_\_\_\_ = \_\_\_\_\_ 17.\* \_\_\_\_\_ = \_\_\_\_\_

4.\* \_\_\_\_\_ = \_\_\_\_\_ 18. \_\_\_\_\_

6. \_\_\_\_\_ 20. \_\_\_\_\_

7. \_\_\_\_\_ 21.\* \_\_\_\_\_ = \_\_\_\_\_

8. \_\_\_\_\_ 28. \_\_\_\_\_

13.\* \_\_\_\_\_ = \_\_\_\_\_ 30.\* \_\_\_\_\_ = \_\_\_\_\_

15.\* \_\_\_\_\_ = \_\_\_\_\_ 31. \_\_\_\_\_

**FACTOR 2 SCORE \_\_\_\_\_\_**

## Factor three: Personal Control

3.\* \_\_\_\_\_ = \_\_\_\_\_ 26.\* \_\_\_\_\_ = \_\_\_\_\_

14.\* \_\_\_\_\_ = \_\_\_\_\_ 32.\* \_\_\_\_\_ = \_\_\_\_\_

25.\* \_\_\_\_\_ = \_\_\_\_\_

**FACTOR 3 SCORE \_\_\_\_\_**

**Filler items (Do Not Include in Scoring)**

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

**TOTAL PSI SCORE \_\_\_\_\_**

**Denson, Buelin, Lammi & D’Amico Assessment of Final Project – Online Version**

Denson, C. D. , Buelin, J. K. Lammi, M. D., & D’Amico, S. (2015, Fall). Developing instrumentation for assessing creativity in engineering design. Journal of Technology Education 27(1), pp 23-40. Retrieved from <https://eric.ed.gov/?id=EJ1087892>.

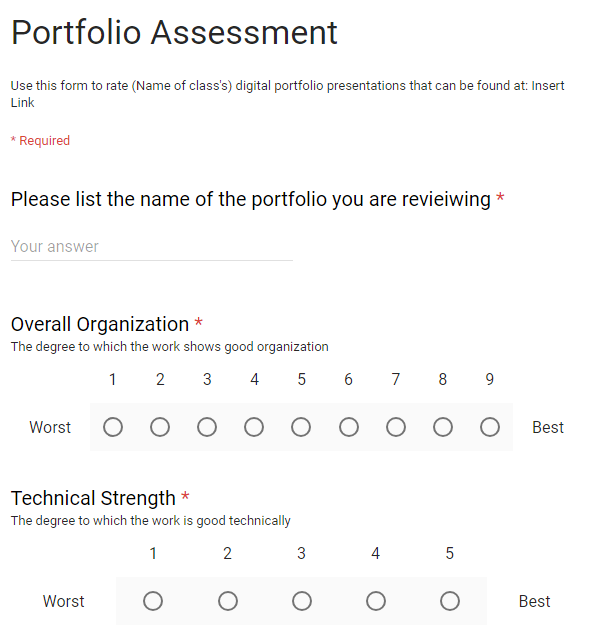
Used with permission of authors (July 1, 2018)

1. Read Denson, Buelin, Lammi, & D’Amico’s article for assessment procedure and questions. Attend to sliding scale response layout for questions.



1. Use Google forms (<https://zapier.com/learn/google-sheets/how-to-use-google-forms/>) or other survey tool to create a similar survey that is accessible to your chosen group of portfolio evaluators. For example a rating scales from 1 (worst) to 9 (best) for the is available in Google Forms. Use the assessment tool to allow raters to provide feedback on the following 11 items:
   1. Overall organization [*The degree to which the work shows good organization*]
   2. Technical strength [*The degree to which the work is good technically.*]
   3. Neatness [The amount of neatness shown in the work.]
   4. Complexity *[The level of complexity of the design.]*
   5. Novel use of materials *[Degree to which the use of materials is unique and interesting.]*
   6. Overall aesthetic appeal *[In general, the degree to which the design is aesthetically appealing.]*
   7. Pleasing use of color and/or value *[The degree to which the design shows a pleasing use of color and/or value.]*
   8. Effort evident *[The amount of effort that is evident in the product.]*
   9. Novel idea *[Degree to which the design explores a unique and interesting idea.]*
   10. Pleasing use of shape/form *[The degree to which there is a pleasing use of shape/form in the design.]*
   11. Creativity *[Using your own subjective definition of creativity, the degree to which the design is creative.]*
   12. Liking *[Your own subjective reaction to the design; the degree to which you like it.]*

**Example of assessment tool using Google Forms**



|  |  |
| --- | --- |
|  |  |

**Denson, Buelin, Lammi & D’Amico Assessment of Digital Portfolio – Hard Copy/Slider Scale**

Denson, C. D. , Buelin, J. K. Lammi, M. D., & D’Amico, S. (2015, Fall). Developing instrumentation for assessing creativity in engineering design. Journal of Technology Education 27(1), pp 23-40. Retrieved from <https://eric.ed.gov/?id=EJ1087892>. Used with permission of authors (July 1, 2018)

Used to assess students’ 5 minute digital portfolio presentation assessed by outside evaluators

1. Overall organization – you work shows good organization

Worst 1--------2--------3--------4--------5--------6--------7--------8--------9 Best

1. Technical strength – work is good technically

Worst 1--------2--------3--------4--------5--------6--------7--------8--------9 Best

1. Neatness - The amount of neatness shown in the work.

Worst 1--------2--------3---------4--------5--------6--------7--------8--------9 Best

1. Complexity of the design

Worst 1--------2--------3---------4--------5--------6--------7--------8--------9 Best

1. Novel Use of material

Worst 1--------2--------3---------4--------5---------6--------7--------8--------9 Best

1. Overall aesthetic appeal

Worst 1--------2--------3---------4--------5--------6--------7--------8--------9 Best

1. Pleasing use of color and/or value

Worst 1--------2--------3---------4--------5--------6--------7--------8--------9 Best

1. Effort evident

Worst 1--------2--------3---------4--------5--------6--------7--------8--------9 Best

1. Novel idea

Worst 1--------2--------3---------4--------5--------6--------7--------8--------9 Best

1. Pleasing Use of shape/form

Worst 1--------2--------3---------4--------5--------6--------7--------8--------9 Best

1. Creativity

Worst 1--------2--------3---------4--------5--------6--------7--------8--------9 Best

1. Liking

Worst 1--------2--------3---------4--------5--------6--------7--------8--------9 Best