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| **P R O J E C T O V E R V I E W** |
| **Name of Project:** Lean Manufacturing  | **Duration (days):** 3 Weeks | **Written For:** ☒Period Schedule ☐Trimester ☐Block Schedule ☐Semester |
| **Subject/Course:** Reading, math  | **Teacher(s):** Debora Hunt | **State:** Iowa | **Grade Level(s):** ☐7/8 ☒Alternative Ed. ☐9/10 ☐Out of School ☒11/12 ☐Any |
| **Other Subject Areas to be Included:** Critical thinking, budgeting  |
| **Project Summary**What will the students be doing? What challenges will they face? What is the purpose? | Students develop a deeper understanding of how manufacturing works.After completion of PBL students will earn a Beginners Lean Training Certificate |
| **Driving Question**What problems/questions will students be learning about? | Is it possible to use less physical energy and earn more money? |
| **Entry Event**How will you introduce the topic in an engaging way? | Build small wooden benches |
| **Public Product**How will students be able to demonstrate what they have learned? | **Team:** Teach lean manufacturing to 5th graders  | **Presentation Audience**☒Class☒School☒Community☒Experts☐Web☐Other: Click here to enter text. |
| **Individual:** Wooden Benches  |

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| **P R O J E C T O V E R V I E W** |
| **Competency Attainment**What competencies should students understand, know, and be able to do as a result of this PBL? | **What competencies will you introduce in this project?** (Level 1):A-1 Manufacturing Tour A-2 Talks from employers after tour B-12 Manufacturing test C-14 Dress appropriately for tour  C-19 Demonstrate professional behavior E-26 Work with peers during simulation activity F-36 Demonstrate appropriate behavior D-21 D-24 Listening activities, verbal instructions, brainstorming debriefing session D-25 Manufacturing quiz E-27 Arranging time for tour **What competencies will be in progress during this project?** (Level 2): A-6 Verbalize in class the changes in work based from debriefing session C-15 – C-19, H-68, H-75 Demonstrate changes in how work is accomplished based on debriefing sessions D-22 D-23 Demonstrating understanding by completing homework assignments E-27 Assisting facilitator E-29 k’nex activities **What competencies will students be able to demonstrate mastery by the end of the project?** (Level 3):A-6 Demonstrate knowledge when teaching grade school students C-14 Professional dress when teaching C-16 Debriefing building process when teaching C-17 Implementing time restraints with instructions C-18 Modeling to students the instructions in the building process F-35 & F-36 Role model reasonable behavior and positive attitude E-30 Earning certificates  |
| **Formative Assessments** (Check all that apply or add your own)How will you assess student learning throughout the PBL? | ☒Checklists | ☒Notes | ☒Plans/Outlines/Prototypes |
| ☒Concept Maps | ☐Online Test/Exams | ☒Quizzes/Tests |
| ☐Journal/Learning Log | ☒Practice Presentations | ☒Rough Drafts |
| ☐Other (see PBL Library for ideas): ●cost analysis  |
| **Summative Assessments**(Check all that apply or add your own)How will you assess student learning at the completion of the project? | ☐Essay | ☐Oral Presentation w/Rubric | ☐Peer Evaluation |
| ☐Multiple Choice/Short Answer Test | ☐Written Final w/ Rubric | ☒Self-Evaluation |
| ☒Other (see PBL Library for ideas): Homework assignments – ●Spaghetti floor ●5 Ss before and after pictures ● time assessment ● teaching lean manufacturing to 5th graders  |
| **Reflection Methods**(Check all that apply or add your own)How will you provide intentional opportunities for students to reflect on learning throughout the PBL? | ☐Journal/Learning Log | ☐Fishbowl Discussion | ☐Survey |
| ☒Whole-Class Discussion | ☐Focus Group |  |
| ☒Other (see PBL Library for ides): Practice teaching lean, debriefing session after each project, cost analysis sheets  |

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| **P R O J E C T O V E R V I E W** |
| **Career Association**How will you build student leadership into the PBL? Think of natural ways to build leadership, extend ownership, and empower your students through this project. | **Which CA Goal(s) will be covered in this PBL?** ☒Leadership☐Community Service☒Career Prep☐Civic Awareness☐Social Awareness☒Fundraising☐Other: Click here to enter text. | **What roles will your officers lead in planning?**Leadership: Assis the LEAN Manufacturing Instructor during their visit Community Service: Click here to enter text. Career Prep: Contact Manufacturing Company to arrange a tourCivic Awareness: Click here to enter text. Social Awareness: Click here to enter text. Fundraising: How and where to sell benches Other: Click here to enter text. |
| **How will you incorporate committees, or the rest of your class?** Leadership: Click here to enter text. Community Service: Click here to enter text. Career Prep: Click here to enter text. Civic Awareness: Click here to enter text. Social Awareness: Click here to enter text. Fundraising: Selling benches Other: Click here to enter text. |
| **Which Career Pathways will be incorporated into this PBL?** | **Which employers/businesses will you work with throughout this project?**John DeereLean Manufacturing Instructor  |
| ☐Agriculture, Food & Natural Resources☐Architecture & Construction☐Arts, A/V Technology &Communications☐Business Management &  Administration☐Education & Training☐Finance☐Government & Public Administration☐Health Sciences☐Hospitality & Tourism | ☐Human Services☐Information Technology☐Law, Public Safety, Corrections &  Security☒Manufacturing☐Marketing☐Science, Technology, Engineering &  Math☐Transportation, Distribution &  Logistics |
| **Employer Engagement Strategy** How will you utilize employer connections to increase relevance? | **Circle One:**☒Meet and Greet☒Classroom Presentation☒Project Observation☐Skype/Webinar☐Mock Interview☐Other: Click here to enter text. | **Circle Two:**☐Service Learning☒Company Tour☒Mentoring☒Co-Develop PBL/Scaffolding☒Critique of Public Product ☒Other: Networking  | **Circle 3:**☐Job Shadow☐Limited Time Work Experience☐Pre-Apprenticeship☐Internship/Apprenticeship☒Summer Job☒Other: Certificate in Beg Lean Mnfg |

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| **P R O J E C T O V E R V I E W** |
| **Scaffolding***\*this is a high level overview, details can be found in the Student Learning Guide*What lessons, exercises, and activities will be integrated into the project that build a student’s understanding and experience with the content? How is this scaffolding be leading students towards the Driving Question and ultimately to a high-quality Public Project? | **Prior to the Project Beginning:**(What do you need to do to prepare for the project to begin?)Connect with community partner who can facilitate lesson in lean manufacturing Confirm date for John Deere tour Create and laminate picture individual cards of the 5 senses ex...a picture of eyes, ears, nose, mouth, hand Create Certificates Empty Pizza Boxes Pre-cut wood for benches (see instructions to build leopold benches)Confirm a date with 5th grade teacher to work with class. Students will tour a manufacturing plantStudents will participate in an activity that simulates manufacturing and begins explanation of LEANStudents will participate in activities that promote chronological thinking Students will play games to promote listening skills **Launching the Project:**(How will you SPARK their attention?)Students will build small wooden benches not using lean techniques Students will build benches using lean techniques and compare results **Project Navigation:** (What are the main ideas and lessons you will need to take from the first day, through completion of the PBL?)How to think about the best use of materials and space to get the maximum benefits  |
| **Accommodations**What modifications will you need to make to fit the needs of all students in your classroom? | **Adjustments may be made based on 504 or IEP accommodations** | **Revision & Critique**How will you provide opportunities for students to review their work and provide feedback for improvement?  | Debriefing sessions, building products better with new information |
| **Resources**How will you incorporate business professionals, employers, community leaders, organizations, technology, funding and other resources to implement this project?  | **WHO will you be incorporating?**☒School Staff☒Business Professionals/Employers☒Community Leaders/Organizations☐Technology ☐Other: Click here to enter text. | **HOW will you be incorporating? (please describe)**John Deere team – tour, job descriptions, mnfg simulation activities Lean instructor - teach lesson - 5th grade teacher and her/his class Principal in students demonstrating knowledge of subject and inviting to certificate ceremony  |

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| **S T U D E N T L E A R N I N G G U I D E** |
| **Project Title:** Lean Manufacturing  |
| **Driving Question:** How can I earn more money by changing where I stand at work |
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| **Description of Activity/Product**What will students, specialists, guests, etc. be doing during this portion? | **Learning Outcomes/Targets**What knowledge, understanding & success skills will students need to successfully complete this portion? |
| ☒Formative☐Final Product | Day 1 *All Day* **John Deere Tour** Provide students with **check off list** for tour Learn about some of the job opportunities with companyParticipate in a simulation assembly activity using Legos to build bulldozers  | SWBAT: (Students will be able to…)Complete a check off list looking for specific items during their tour, i.e. clutter, number of employees, location of equipment, finished product Articulate their frustrations and success in with the simulation activity  |
| ☒Team☒Individual |
| ☒Formative☐Final Product | Day 2 *40-50 minutes* **Debriefing** from yesterday’s activitiesDiscuss check off list (Keep these list for later use in PBL) Answer, “What did you think of yesterday’s tour?”Write one item each about something they liked from their day | SWBAT:(Using 5 senses picture cards) Articulate what they saw, heard, smelled, felt during the tour List one thing they liked or learned about the day in a thank you card |
| ☐Team☒Individual |
| ☒Formative☐Final Product | Day 3 *20-30 minutes* **Manufacturing Quiz** *10 – Minutes* **Listening Activity** Youtube Name That Sound <https://www.youtube.com/watch?v=lZsssS_I_2>Y  | SWBAT: Begin to develop analytical thinkingDevelop listening skills  |
| ☐Team☒Individual |
| ☒Formative☐Final Product | Day 4 *40 – 50 minutes* **Listening Activity** Draw a PigYoutube -Draw a pig <https://www.youtube.com/watch?v=v->  | SWBAT: Begin to develop their listening skills  |
| ☐Team☒Individual |
| ☒Formative☐Final Product | Day 5 *50- minutes* **Listening Activity** – Tinker Toys (may use any type of construction toy) Working in pairs, one student builds a structure behind a pizza box then verbally describe structure to their partner to get him/her to build same structure without seeing it.  | SWBAT:Continue to develop listening skills  |
| ☒Team☐Individual |
| ☒Formative☐Final Product | Day 6 *50 Minutes* **Begin building project** (Lean Instructor)  | SWABT: Build as many benches as possible to completion  |
| ☒Team☐Individual |
| ☒Formative☒Final Product | Day 7 *50 minutes* **Continue to build benches**  | SWBAT: Show understanding of building by improving their work and building more benches to completion |
| ☒Team☐Individual |
| ☒Formative☐Final Product | Day 8 *50 minutes* **Debrief and Build Again – Spaghetti floor** (see picture) Lean instructor gives cost for current product. Introduce Lean manufacturing and spaghetti floor Discuss ways to improveChange floor plan and begin building product using Lean  | SWBAT: Give one suggestion in improving the production of the productIncrease production by 50% |
| ☒Team☐Individual |
| ☒Formative☒Final Product | Day 9 *50 Minutes* **Last day to Build Benches** Lean instructor debriefs and shows measurable improvements with production line.  | SWBAT: Demonstrate Lean techniques by using new model Continue to improve manufacturing of product  |
| ☒Team☐Individual |
| ☒Formative☒Final Product | Day 10 *50 Minutes* **Cost Analysis** Create a cost analysis sheet comparing manufacturing cost and assign a dollar amount to final product | SWBAT: (Summative Assessment)Using cost analysis sheets and finished product SWBAT explain to an outside person (*invite the principal*) the lean process  |
| ☒Team☐Individual |
| ☐Formative☐Final Product | Day 11 *30 Minutes* **Spaghetti Floor** Draw floor plan of their house. Show the steps taken to get ready for school. Find way to improve the routine; draw new floor plan | SWBAT: Demonstrate ways to make their morning routines more efficient using floor plans  |
| ☐Team☒Individual |
| ☐Formative☐Final Product | Day 12 *50 Minutes* **The 5Ss**Youtube video explaining the 5Ss <https://www.youtube.com/watch?v=O4mPCvOfUU4>Utilize check list from tour Complete 5Ss worksheetsHomework: Apply the 5Ss to an area at home  | SWBAT:Discuss areas of 5Ss in check list from tour Take a before and after picture of work |
| ☐Team☒Individual |
| ☐Formative☐Final Product | Day 13 *50 Minutes* **BuildingActivity** (student voice and choice)Students decide on a simple to produce product they can teach to 5th graders.  | SWBAT:Provide specialist with idea and list of items needed to create the product |
| ☒Team☐Individual |
| ☒Formative☐Final Product | Day 14 *50 Minutes* **Practice Activity**Have leadership officer facilitate this activity by recreating the lessons from building benches  | SWBAT:Apply Lean manufacturing and 5Ss in their practice with moderate assistance from the specialist  |
| ☒Team☐Individual |
| ☐Formative☒Final Product | Day 15 *2 Hours* **Teach Lean Mnfg** JAG students facilitate a lean manufacturing lesson for 5th graders. Students will include cost analysis in lesson  | SWBAT: (Summative Assessment)Show high level understanding of lean manufacturing by teaching the subject matter to younger students  |
| ☒Team☐Individual |
| ☐Formative☐Final Product | Day 16 50 Minutes **Celebration** In a special ceremony provided by the specialist, JAG students will be presented with a certificate of completion by their lean manufacturing instructor  | * Invite parents, principal, John Deere representative to the celebration
 |
| ☐Team☒Individual |
| ☐Formative☐Final Product | Click here to enter text. | Click here to enter text. |
| ☐Team☐Individual |

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| **P R O J E C T C A L E N D A R** |
| M O N D A Y | T U E S D A Y | W E D N E S D A Y | T H U R S D A Y | F R I D A Y |
| **P R O J E C T W E E K O N E** |
| John Deere Tour | Debrief from yesterday’s tour using 5 senses cardsWrite a thank you card – students write one thing they learned from their visit  | Manufacturing quizListening activity - Name that Sound  | Listening Activity Draw a Pig | Listening Activity Tinker Toys -  |
| **P R O J E C T W E E K T W O** |
| Day 1 Build Benches | Day 2 Building Benches  | Day 3 Building Benches  | Last Day Building Benches  | Cost Analysis  |

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| **P R O J E C T C A L E N D A R** |
| M O N D A Y | T U E S D A Y | W E D N E S D A Y | T H U R S D A Y | F R I D A Y |
| **P R O J E C T W E E K T H R E E** |
| Spaghetti Floor  | The 5Ss  | Brainstorm product for 5th graders to build  | Practice building product  | Teach 5th graders lean mnfng  |
| **P R O J E C T W E E K F O U R** |
| Certificate Ceremony  | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. |

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| **P R O J E C T C A L E N D A R** |
| M O N D A Y | T U E S D A Y | W E D N E S D A Y | T H U R S D A Y | F R I D A Y |
| **P R O J E C T W E E K F I V E** |
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| **A D D I T I O N A L I N F O R M A T I O N** |
| * **Green text indicate supporting documents**
* This lesson can be taught using a variety of end-product. It does not need to be benches.
* Tailor make this lesson to fit your class
* A natural addition to this lesson would be to sell the made product for a fundraiser
 |