GEORGIA | PEACH STATE PATHWAYS

Career, Technical, & Agricultural Education

FOUNDATION SKILLS

PATHWAY: All CTAE Pathways

COURSE: All CTAE Courses

UNIT 4.6: Time Is Money – Man-Hours

INTRODUCTION

Annotation:

As Benjamin Franklin once said, "Time is money." This unit demonstrates the relationship between those two concepts. The need to earn money and spend it wisely is important. Because time translates to money, time management is an important skill for students to learn. In this unit, students develop an appreciation of time by comparing and contrasting time to money, and understand how to budget their time wisely. The unit concludes with reinforcement of time management concepts through real-world applications. This unit will ensure that students realize how important man-hour labor estimates are to profit.

Grade(s):

X	9th
X	10th
X	11th
X	12th

Time:

3-4 50 Minute Class Periods

Author:

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Students with Disabilities:

For students with disabilities, the instructor should refer to the student's IEP to be sure that the accommodations specified are being provided. Instructors should also familiarize themselves with the provisions of Behavior Intervention Plans that may be part of a student's IEP. Frequent consultation with a student's special education instructor will be beneficial in providing appropriate differentiation.

FOCUS STANDARDS

GPS Focus Standards: Please list the standard and elements covered.

CTAE-FS-4 Problem Solving and Critical Thinking: Learners define and solve problems, and use problem-solving and improvement methods and tools.

National / Local Standards / Industry / ISTE:

ESS03 Problem-Solving and Critical Thinking: Solve problems using critical thinking skills (analyze, synthesize, and evaluate) independently and in teams. Solve problems using creativity and innovation.

UNDERSTANDINGS & GOALS

Enduring Understandings:

- The need to earn money and spend it wisely is important. Because time translates to money, time management is an important skill for students to learn.
- Man-hour estimates and profit are directly related. Therefore, employers must correctly estimate man-hours in order to make a profit.

Essential Questions:

- Why is it important to understand the relationship between time, productivity, and profit?
- How do you measure work time for a task?
- What does man-hour mean?
- Why is time management important in the workplace?

Knowledge from this Unit:

- Students will analyze the influence of various factors in time management.
- Students will draw conclusions and improve problem-solving and estimating skills concerning time and money.

Skills from this Unit:

- Students will be able to prescribe and implement time management behaviors.
- Students will estimate and measure man-hours and total costs of labor.

ASSESSMENT(S)

Assessment Method Type: Select one or more of the following. Please consider the type(s) of differentiated instruction you will be using in the classroom.

____ Pre-test
X Objective assessment - multiple-choice, true- false, etc.
X_ Quizzes/Tests
__ Unit test
____ Group project
____ Individual project
____ Self-assessment - May include practice quizzes, games, simulations, checklists, etc.
__ Self-check rubrics
__ Self-check during writing/planning process
__ Journal reflections on concepts, personal experiences and impact on one's life
__ Reflect on evaluations of work from teachers, business partners, and competition judges
__ Academic prompts
__ Practice quizzes/tests
____ Subjective assessment/Informal observations
__ Essay tests
__ Observe students working with partners
__ Observe students role playing
____ Peer-assessment
__ Peer editing & commentary of products/projects/presentations using rubrics
__ Peer editing and/or critiquing
X Dialogue and Discussion
__ Student/teacher conferences
__ Partner and small group discussions
X_ Whole group discussions
__ Interaction with/feedback from community members/speakers and business partners
X Constructed Responses
__ Chart good reading/writing/listening/speaking habits
X_ Application of skills to real-life situations/scenarios
____ Post-test

Assessment(s) Title:

Paper Step-Through Activity

Estimates for Home Renovation Activity

Assessment(s) Description/Directions:

Students will estimate the man-hours needed to complete an activity in the classroom.

Students will estimate the costs of labor using the worksheet provided in the attachment.

Attachments for Assessment(s): Please list.

FS_4.6_Paper_Step-Through_Activity

FS_4.6_Paper_Step-Through_Instructions

FS_4.6_Home_Renovation_Activity

LEARNING EXPERIENCES

Instructional planning: Include lessons, activities and other learning experiences in this section with a brief description of the activities to ensure student acquisition of the knowledge and skills addressed in the standards. Complete the sequence of instruction for each lesson/task in the unit.

Sequence of Instruction

1. Identify the Standards. Standards should be posted in the classroom for each lesson.

CTAE-FS-4 Problem Solving and Critical Thinking: Learners define and solve problems, and use problem-solving and improvement methods and tools.

2. Review Essential Questions.

- Why is it important to understand the relationship between time, productivity, and profit?
- How do you measure work time for a task?
- What does man-hour mean?
- Why is time management important in the workplace?

3. Identify and review the unit vocabulary.

4. Lesson One.

1. Ask:

   - What flies but has no wings?

   Discuss that the answer to the riddle is "time."
2. Ask: When on the job, does time move slower or faster when you are busy? Why?
3. Have students come up with and explain some popular sayings about time (i.e. "time flies," "no time like the present," "in the nick of time," "Father Time," etc.) Discuss with the students Benjamin Franklin's saying, "Time is Money." Encourage students to comment on what it means. Have students comment on which they think is more important (time or money) and have them defend their reasons.
4. Use the attached Venn diagrams to explain and demonstrate the relationship between **time**, **productivity**, and **profit**. As time and productivity overlap (or time is spent productively), profit increases. The opposite is also true. The farther apart time and productivity shift (meaning that time is wasted), the lower the profit will be.
5. Have students brainstorm ways for them to save time while at work or on the job. Make two lists on the board, titled "Saved Time" and "Lost Time." Ask the students to write examples of ways time is saved and ways it is wasted under the appropriate heading. Example answers may be excessive bathroom breaks, receiving personal phone calls while at work, answering personal

emails, or taking lengthy lunch breaks. Ask the students to explain how the concept of saved and lost time relates to productivity and profit.

6. A **man-hour** is the amount of work performed by an average worker in one hour. Man-hours are measured in estimates of the amount of time it typically takes to perform a task. Man-hours are used to calculate the labor cost for any given task, such as construction, auto-repair, manufacturing, and landscaping. Employers also use man-hours to determine how many hours a worker should work in a year. For example, if a worker works 40 hours a week for 50 weeks, that is approximately 2,000 man-hours. This assumes a two-week vacation and a 40-hour work week.
7. **Real-World Scenario: Lawn Mower Factory Labor Needs**
   - To emphasize the importance of measuring man-hours, give the students this scenario and work through the problem with the students.
   - You are the personnel manager for a lawn mower company that is moving its manufacturing facility to a small town in central Georgia. Each mower takes one person 3 hours to produce. The facility must produce 900,000 mowers next year. There are 800 available workers within a 50-mile radius of the proposed plant. Will there be enough workers available for your company to meet its yearly quota? Assume that each worker will contribute 2,000 man-hours of labor over the course of a year.
   - SOLUTION: Multiply the number of mowers that need to be produced by the number of hours it takes to produce each mower. This number is the number of man-hours that will be needed to produce the mower quota.

     900,000 mowers × 3 hours/mower = 2,700,000 hours
   - Now divide the total number of man-hours by the number of hours each worker can work in one year. This number is the number of workers that will be needed to produce the yearly quota of mowers.

     2,700,000 ÷ 2,000 = 1350 workers
8. **Classroom Activity: Paper Step-Through Activity**
   - This activity is to illustrate productivity time in man-hours. Tell the class to assume that the paper ring/finished product is a product that could be produced for sale.
   - Divide the class into groups of 3. Give each group a single piece of paper, a pair of scissors, and a stopwatch or wristwatch. Using only the scissors to cut the paper, each member of the group must step through the finished product. Give each group a copy of the worksheet Paper Step-Through Activity. Have the students estimate how many man-hours it will take to complete the task.

- Show the PowerPoint titled Paper Step Through Instructions to illustrate how the activity is to be done.
- Have the students complete the task. When they are finished, ask them if their group's estimate was accurate. Have the students re-estimate the number of man-hours needed to finish the task, keeping in mind that they will be able to do it faster the second time. Have the students complete the task again.
- Let the students complete the paper step-through a few more times, each time trying to keep the time it takes as low as possible.
- To calculate man-hours to produce one paper ring, the time to complete must be multiplied by the number of people in the group – even if they were just observing.

9. Paper Step-Through Discussion
    - Ask the students a series of questions relating the Paper Step-Through activity to time, productivity, and man-hours. Examples are:
        - Why do you think your initial man-hour estimates were off? Were they higher or lower than the actual time it took to complete the activity?
        - As your group became faster at completing the activity, did you decrease your man-hour estimate? What implications does this have for employers considering training workshops?
        - Did your group use any shortcuts in order to decrease the time it took to complete the activity? How does this relate to productivity?
        - Were all members of your group productive all the time?
        - You may wish to include questions that more closely relate to the course you are teaching.
        - Optional: Problem Solving Activity

          You may want to have the students make the largest ring possible or see who can make the ring in the fastest time. A prize can be offered to the group with the largest paper step-through ring or the fastest time.

5. Lesson Two.

1. Review the concepts covered in the previous lesson, focusing on man-hours.
2. Many employers have a **man-hour index (MHI)** they use to determine the amount of time any given job or task should take to complete. The employer will then apply these estimates to every job or task his employees undertake. This way the employer does not have to recalculate the man-hours of a task for every job his company must complete.
    - MHIs are often used in manufacturing plants and auto repair shops.

- Example: The MHI for replacing a fuel pump may be 1.2 hours. A worker must match this time or finish the task in less than 1.2 hours to be productive.
- Ask the students for other examples.

3. An important concept related to the man-hour is making production. Employers will often set a certain standard of production that employees are to achieve in a given time period. Production is defined as the number of items that must be produced in a given time period. These standards are similar to production goals. Employees who go beyond production will often receive additional wages or a bonus, while those that fail to make production may be terminated.
4. **Busy Burger Man-Hour Activity**

   To emphasize how important small amounts of time are, lead the students through this class activity:

   - Suppose the Busy Burger Company has the following situation and related factors. How much money can they save over the course of a year for all 85 store locations by shortening the distance for an employee to get onion rings for an order?
   - **Given factors:**
     - Employees must walk 30 feet to get onion rings from a special fryer.
     - It takes 18 seconds to walk to the fryer and back.
     - The fryer could be moved 15 feet closer to the sales counter, shortening the walk to only 9 seconds.
     - The employees make $9/hour
     - Each store sells 350 onion ring orders per day, 365 days a year.
     - Busy Burger has 85 locations.
   - SOLUTION: You first need to find how much the store will save per order by moving the fryer. To do so, divide the 9 seconds that will be saved by 3600 (60 seconds/minute, 60 minutes/hour) to find the number of hours saved.

     $9 \div 3600 = .0025$ hours

     Next, you need to find how much .0025 hours is of the employee's hourly wage, so you multiply .0025 by $9/hour wage.

     $.0025 \times \$9 = \$.0225$

     This is how much money is saved per order.
   - Now you multiply $.0225 by the number of orders per day, the number of days in a year, and the number of store locations. This number will be the total amount saved by Busy Burger for all their locations over the course of a year.

     $\$.0225 \times 350 \times 365 \times 85 =$ **$244,321.88**

- Note: This activity is intended to illustrate how small amounts of time carry large consequences. This problem makes many assumptions, including that every second saved will result in financial savings. However, this is not always the case in an actual work environment.

5. The concept of man-hours is an important management tool for both employers and employees alike. The concept of man-hours is very important. No matter what business you are in – "TIME is MONEY."
6. **Estimates for Home Renovation Activity.**
   - To ensure that students understand the value of the man-hour, have them tally and compare costs and calculate profit of the estimates for home renovation given in the attached worksheet titled Home Renovation Activity.
   - Explain to the students that many times contractors will offer customers a "bid," which is essentially an estimate of how much the work will cost. As the Home Renovation Activity illustrates, contractors use man-hours to estimate the costs of labor. However, sometimes the actual number of man-hours exceeds or falls below the estimated number of hours. This affects the amount of profit the company receives. An accurate bid by the estimator is essential in keeping a company profitable.
   - Note: the profit figures found in the problems do not include the additional percentage contractors would charge for their own profit.
7. **Activities.**

   Give the students the following worksheets to complete. See attached files for the worksheets.

   A. Man-Hours and Bidding: Road Paving

   B. Man-Hours and Bidding: Electric Wiring

   C. Man-Hours and Bidding: Oven Assembly

   D. Man-Hours and Bidding: Pool Installation

   E. Man-Hours and Bidding: Pipe Installation (Note: This is the most difficult activity.)

6. Summary.

1. Students should understand that "Time is money." Review the lesson by asking the following questions:
   - Why is it said that "Time is Money"?
   - What is a man-hour?
   - Why is it important to accurately measure and estimate time?

Attachments for Learning Experiences: Please list.

FS_4.6_Venn diagram_Time_Productivity_and_Profit

FS_4.6_Home_Renovation_Activity

FS_4.6_Paper Step Through Activity

FS_4.6_Paper Step Through Instructions

FS_4.6_Man-Hours and Bidding Projects – Road Paving

FS_4.6_Man-Hours and Bidding Projects – Electric Wiring

FS_4.6_Man-Hours and Bidding Projects – Oven Assembly

FS_4.6_Man-Hours and Bidding Projects – Pool Installation

FS_4.6_Man-Hours and Bidding Projects – Pipe Installation

CULMINATING PERFORMANCE TASK (Optional)

Culminating Unit Performance Task Title:

Man-Hours and Bidding Activities

Culminating Unit Performance Task Description/Directions/Differentiated Instruction:

These activities will apply the knowledge the students have gained about man-hours to real-world industrial scenarios.

Attachments for Culminating Performance Task: Please list.

FS_4.6_Man-Hours

UNIT RESOURCES

Web Resources:

Attachment(s): Supplemental files not listed in assessment, learning experiences, and performance task.

Materials & Equipment:

Scissors (at least 7 pair), copy paper, stopwatch or wristwatch

What 21st Century Technology was used in this unit:

X	Slide Show Software		Graphing Software		Audio File(s)
	Interactive Whiteboard		Calculator		Graphic Organizer
	Student Response System		Desktop Publishing		Image File(s)
	Web Design Software		Blog		Video
	Animation Software		Wiki		Electronic Game or Puzzle Maker
	Email		Website		