Mathematics: The Language of STEM
Scheduler
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CONTENT AND TASK DECISIONS

Grade Level(s): 3rd

Description of the Task: Students explore elapsed time in this problem-based learning activity to create a daily school schedule for their grade level.

Indiana Mathematics Content Standards: 3.M.3: Tell and write time to the nearest minute from analog clocks, using a.m. and p.m., and measure time intervals in minutes. Solve real-world problems involving addition and subtraction of time intervals in minutes.

Indiana Mathematics Process Standards: PS.2: Reason abstractly and quantitatively.

Mathematics Content Goals: Students will apply their knowledge of a.m. and p.m. to correctly label times on their schedules. Students will measure time intervals in minutes to determine the length of time needed for various activities. Students will use addition and subtraction of time intervals to create a useable daily schedule.

Language Objectives: With support from peer group members and the teacher, students will write an explanation of a possible daily schedule using words, pictures, and numbers.

Materials:
- Schedule Guidelines from the Principal (see below)
- Schedule Plan Papers (multiple copies for each student/group may be needed)
- Pencils
- Paper for sketching, writing, and mathematics – blank, lined, grid
- Analog practice clocks

THE LESSON

Before: Prior to the lesson, create groups of 3-4 students for the following activity. Present students with the problem-based task and build anticipation for the activity.
- **Activate prior knowledge,** begin by asking some questions about the time intervals during the school day. Record the questions and some student answers on the board. Examples of questions include:
    - How long is our school day?
    - When do we go to lunch?
    - How long is recess?
    - At what time does Art end?
    - How much time do we spend reading in small groups?
    - How long is math?
    - When is school dismissed?

For each question, ask students to justify and explain their thinking. Encourage students to evaluate each other's answers and thinking. When a student answers one of the questions

above, involve additional students by asking questions like "What do you think about that?" or "Do you agree or disagree with that thinking?"

Next, explain to students that the principal has asked the class for input about schedule changes for the grade level. The principal would like groups of students to develop new schedule possibilities and present them to a group of teachers/parents/school board members for evaluation and possible adoption. The principal has asked that students work in groups of 3-4 students to allow for collaboration and a variety of unique ideas.

Ask students to think and write independently for two minutes about things that they would change about the daily schedule. Remind students that they should spend the entire time writing and that the goal of this time is to generate ideas that could be included in the schedules they will create. Once, students have finished writing for two minutes, have students pair up and share ideas with another student. Students should feel free to ask questions of their partners and to write down any ideas that they hear from their partners that they would like to incorporate in their own schedules.

- **Be sure the problem is understood,** pass out the Schedule Guidelines from the Principal and read through it with the students. Address any questions that students may have about the guidelines. Keep in mind that students may have additional questions as they begin to create their schedules. Answer these questions in a way that will provide students with the most flexibility and the most opportunity to design their schedules creatively.

  Next, assign students to their groups and provide each group with a work area. Give each student a copy of the Schedule Plan Paper and explain the expectations for developing and recording their schedules. For each daily activity, students should include a descriptive name, the start time, the end time, and the time interval. Students can record the start and end times by writing the digital time including an a.m. or p.m. label. Encourage students to also write the time using a sketch of an analog clock to improve their own skills and to help others who may be viewing their schedules.
- **Establish clear expectations,** review the Schedules Guidelines from the Principal. Explain the expectation that each group member should complete a copy of the Schedule Plan. Remind students of classroom expectations for group work. Students should work collaboratively. They should work to include all members of the group. If a group member is not participating, the other members of the group should actively draw her/him into the work by asking questions, seeking input, and providing opportunities to participate. All members of a group should have their ideas represented in the final schedule. When disagreements arise, students should use their group work strategies to reach a compromise or come to consensus.

During: Students will be working in groups of 3-4 students to develop a daily schedule based on the guidelines provided by the principal.

- **Let go,** facilitate students collecting and organizing materials, give students space to begin creating their daily schedules, ask open-ended questions, and give students chances to discuss their thinking with each other and with you.
- **Listen actively,** as you move around the room, listen to student conversations. Look for opportunities to engage with students about their thinking about time and time intervals, the ways they record data, the mathematics they use to find time intervals, and any connections or noticings they have as they create their schedules. Listen for agreement or disagreement between and within groups. Encourage meaningful, constructive discussion. Encourage students to explain their thinking and problem solving methods. Listen for students coming to consensus on their ideas.
- **Provide appropriate support** Guide students in creating their schedules, having them check their schedules against the guidelines provided by the principal. Ask for explanations of students'

calculations and for justifications about why they scheduled activities when they did. Encourage students to make their thinking visible in multiple ways: drawing, labeling, writing, mathematics, modeling with analog clocks, and speaking.

- **Provide worthwhile extensions**. Students could be challenged to record time data from their daily lives to see how efficient their daily schedules are. Students could answer questions like "How much time do we spend in line each day?", "How long does it take us to transition from math to reading?", "How many minutes do we spend walking in the hallway each week?"

  The teacher could also create additional problems/guidelines for groups as they create their schedules based on the real needs of the class like needing a 2-minute transition between activities, including travel time between locations, or by adding or subtracting guidelines.

  Finally, students could work in their groups to create a presentation of their schedule that they could actually deliver to the principal and/or a panel of "experts" like parents/teachers/ school board members/etc. Or, based on the work and thinking that students have done, each group could create a list of recommendations about scheduling that could be given to the principal for feedback and further discussion.

After: Each group spends a short amount of time reviewing their schedule and developing their reasoning and justifications for the scheduling decisions that they made. Then each group pairs with another group to present their schedules. Finally the class comes together to share ideas about scheduling, telling time, and time intervals.

- **Promote a mathematical community of learners.** Students work with their group and another group of students. Each group should share their schedule and their reasoning for some of the choices they made. Then the two groups will compare their schedules. Are the schedules similar? Did students use similar methods to find time intervals or to determine whether the start and end times should be labeled with a.m. or p.m.? Is one method more efficient than another? What differences are visible in the two schedules? Are there any ideas from the other group's schedule that you might want to incorporate into your group's schedule?
- **Listen actively without evaluation.** As students present their schedules, mention specific things that they did and mention what that did for you and for the audience or ask a question about why students made that choice. Examples: "I noticed that you included the subtraction problem you use to determine the time interval." and "You drew a picture before you wrote a.m. or p.m. Why did you do that? How did it help you?"
- **Make connections.** Ask students to find similarities and differences in the ways the found time intervals and the ways they created their schedules. Have students share different methods for finding time intervals: subtracting one time from another, adding from the start time to the end time, counting around an analog clock, drawing pictures of clocks, using number lines. Have students share their justifications for a.m. and p.m. labels.
- **Summarize main ideas** Use student presentations of schedules to generate a lists of strategies for finding time intervals and for determining when to use an a.m. or p.m. label. Have students generate some possible rules for finding time intervals and using a.m. and p.m. labels that could be generalized and used to solve future. This information could be used as the foundation for future investigations into schedules and problem-based learning such as planning a field trip or recording and evaluating the amount of screen time on a given day.

ASSESSMENT

Observe: Look for where in the process students are successful. Can they tell time to the nearest hour/5 minutes/minute on an analog clock? How are they finding time intervals? How are they determining

whether a start/end time needs an a.m. or p.m. label. Can students explain their mathematical thinking and justify their answers with words? With pictures? With numbers?

Ask:
Which of the guidelines from the principal is most difficult?
What are you planning to begin your schedule with?
For how many minutes are you planning to have math/science/art?
How did you find the time interval for that activity?
Why did you use the a.m. label for that start time?
Can you convert that time interval into only minutes?
Can you convert that time interval into hours and minutes?
How many minutes will students have recess each day?
How much time are students spending on reading and math each day?
Do you have any additional time left over? What will you use it for?

Schedule Guidelines

Students,

Thank you for being willing to create new schedules and present these to our scheduling panel. Your input will definitely be helpful in developing a new schedule for this grade level. Below are the guidelines about scheduling from the state and from our school district. These guidelines MUST be followed. How you organize the daily schedule and how you make use of any additional time is up to you. Good luck! I will be eagerly awaiting your presentations.

Sincerely,

Principal

State Guidelines:

- 90 minutes daily of reading (uninterrupted block)
- 60 minutes daily of math
- 30 minutes daily for writing
- At least 30 minutes each day for lunch
- At least 30 minutes each day for science or social studies

School District Guidelines:

- School start time must remain the same
- School end time must remain the same
- 15-45 minutes each day for recess
- At least two, 5-minutes restroom breaks daily
- 5 minutes daily for Pledge of Allegiance and announcements
- 30-40 minutes each day for Art, Music, or P.E.

Schedule Plan

Group Members: _____

Activity	Start Time	End Time	Time Interval

Schedule Plan Cont.

Activity	Start Time	End Time	Time Interval