Science Assessment System Through Course Task

Sunflower Salutations

Grade Level:
3

Phenomena:
Heliotropism

Science & Engineering Practices:
Analyzing and interpreting Data
Engaging in Argument from Evidence

Crosscutting Concepts:
Patterns

Designed and revised by Kentucky Department of Education staff
in collaboration with teachers from Kentucky schools and districts.

Preparing to implement Through Course Tasks in the Classroom

What is a TCT?

- TCTs are 3-dimensional tasks specifically designed to get evidence of student competency in two dimensions, Science and Engineering Processes (SEPs) and Crosscutting Concepts (CCC), untethered from Performance Expectations (PEs)/standards. Tasks are sense-making experiences.
- Tasks are to be used formatively. The goal is for both students and teachers to understand areas of strength and improvement for the SEP(s) and CCC assessed within the task.

How do I facilitate a Through Course Task (TCT)?

- TCT facilitation is a collaborative process in which teacher teams calibrate understanding of the expectations of the task and refine strategies to be used during task facilitation.

Before the task:

1. Complete the TCT as a learner – compare understanding of task through the lens of success criteria (identified in the task) in order to understand expectations.
   Success criteria include:
   - What is this task designed to get evidence of?
   - What is the task asking the students to do?
   - What might a student response look like?
2. Identify the phenomenon within the task. Consult resources to assure teacher teams have a deep understanding of associated science concepts.
3. Collaborate to generate, review and refine feedback questions during facilitation.
4. Identify potential "trouble spots" and plan for possible misconceptions.

During the task:

5. Collect defensible evidence of each student's competencies in 3-dimensional sense-making for the task.
6. Ask appropriate feedback questions to support student access and engagement with the task in order to elicit accurate evidence of student capacities.

After the task:

7. Reflect on the task as a collaborative team.
8. Review student work samples to identify areas of strength and areas of need.
9. Determine/plan next steps to move 3-D sense making forward through the strengthening of the use of SEPs and CCCs.

Using the materials included in this packet:

- **Task Annotation:**
  - The task annotation is a teacher guide for using the task in the classroom. Additionally, the annotation gives insight into the thinking of developers and the task overall.

    - Each task has science and engineering practices, disciplinary core ideas, and crosscutting concepts designated with both color and text style:
        - **Science and Engineering Practices**
        - *Disciplinary Core Ideas*
        - Crosscutting Concepts
- **Student Task:** The materials to be used by students to complete the TCT.

Sunflower Salutations Task Annotation

After analyzing and interpreting data about *the relationship between the apparent motion of the sun and the behavior of sunflowers over the course of a day*, **make a claim about the merits of a selected design solution based on specified criteria** using patterns in the data as evidence to support your claim.

Overall intent

The overall intent of this task is to elicit evidence of student ability to use data that they gather from analysis of multiple sources as a means for evaluating design solutions and as evidence to support a claim. Students will analyze and interpret data pertaining to sunflower behaviors, and the relationship between the observed behaviors and the apparent motion of the sun. Students then use this information to evaluate three different pathways through a park (design solutions), and then make a claim about which path best meets the desired criteria (desire to view sunflower faces throughout the day).

Phenomenon within the task

Sunflowers have a unique internal clock known as the circadian clock that causes the plant to face in the direction (east) of the sun in the morning and follow throughout the day. In the evening, the sunflower continues to follow the sun until sunset when it is facing the west. During the night, it returns back to its original position, facing eastward, to being the cycle all over again. This tracking of the sun is known as heliotropism. This phenomenon, sun oriented behavior, is found in young sunflower plants, which enables them maximize photosynthesis. This inherited trait is essential for survival/reproduction of the species. Student geographical location might affect the experience or interpretation of this phenomenon. Students who live in mountainous areas may not have witnessed this phenomenon, as it would be more observable in more open regions.

How the phenomenon relates to DCI

This phenomenon can be related back to the foundational understanding of plant needs (LS1.C) at grade K in that the sunflower turns to gather energy from the sun in order to grow.

It also can be tied to plant life cycles (LS1.B) at grade 3 due to the fact that sunflowers behave in such a way as part of their life cycle. There is a point in the life cycle when the sunflowers no longer turn to face the sun. Because all sunflowers behave in the same

manner, the phenomenon in the task can support future learning that certain characteristics of organisms are inherited from their parents (LS3.A).

What information/data will students use within this task?

Prior knowledge/experiences:

- map skills/directionality
- apparent motion of the sun (appears to rise in the east and set in the west)
- stating claims and supporting them with evidence
- engineering design basics - use of criteria constraints
- synthesizing information

Information in task:

- video clip on the behaviors of sunflowers
- diagram showing relationship between a sunflowers and sun
- synthesis of provided information

Ideas for setting up the task with students

Even though students will witness the phenomenon through videos and diagrams, it would be beneficial for students to observe actual sunflowers as they grow outdoors. Consider having students plant a sunflower garden for use with students the following year or a field trip to an area where sunflowers are grown.

Students should be encouraged to engage in a conversation related to the following topics:

- When is sunrise and sunset?
- In what direction does the sunrise?
- In what direction does the sunset?
- Why do sunflowers follow the sun?
    - Science ABC: Why do Sunflowers Always Face the Sun?
    - NPR: The Mystery of Why Sunflowers Follow the Sun

Note about permissions from NPR: K-12 Use: K-12 teachers may make up to 30 copies of transcripts of NPR content for one-time classroom use. NPR's copyright notice must be legible.

- Why do young plants behave this way and mature plants do not?

Consider grouping students to engage in the Question Formulation Technique (QFT) (Teach Students to Ask Their Own Questions or Question Formulation Technique Video) strategy using the first picture of the sunflower facing the sun as the topic. Hopefully, students can create open and closed ended questions regarding the image to spark their curiosity about the topic.

When administering this TCT, consider having students model the placement of the benches, sun and sunflowers for each map. They will need to understand that the benches should be opposite of the sunflower faces. For instance, the sunflower faces east in the morning. This means that in order to see the sunflower faces, you would need to be facing west. It might be necessary to provide students with multiple opportunities to make sense of this concept so that they can make meaning of the maps.

Intent of the Task for Assessment

This task is designed to determine if students can make a claim based on analyzed data. Students make observations and analyze data in order to identify the relationship between the sun and the flower position by analyzing data from the images and videos. Students will use this knowledge in order evaluate 3 design solutions as well as to support a claim about which map features park benches in the best location to view sunflower faces through the day.

Although the graphic organizers, diagrams and discussion questions are wonderful tools to formatively assess, they are intended to help scaffold and support students as they prepare for the final question, which asks them to state a claim. It is here that teachers will be able to gather evidence related to student ability to successfully use synthesized data as evidence support a claim. Teachers will need to determine the extent of scaffolding provided based on the needs and ability level of their students. Never simply hand the task to the students to complete. In order to ensure that the evidence of student ability can be accurately interpreted, you should always plan for facilitation that encourages authentic engagement.

Success Criteria

Evidence of Learning Desired based on Progression from Appendices

Analyzing and Interpreting Data

- Analyze and interpret data to make sense of phenomena using logical reasoning. (Appendix F)

Engaging in Argumentation from Evidence

- Make a claim about the merits of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem (Appendix F) (3-LS4-4)

Patterns

- Patterns of change can be used to make predictions (Appendix G)

Success Criteria

- Students synthesize information gathered through several sources about the relationship between the apparent motion of the sun and the observable behavior of the sunflowers to reason which of the three proposed designs best meets specified criteria.

Possible Student Responses

- "I believe it is map C. I know this because based on the evidence in the video shows that sunflowers follow the path of the sun from east to west. The position of each of the benches is where visitors will enjoy the faces of the sunflowers at each stop along the Sunflower Tour."
- Map C is the best plan. If you start at the entrance and pretend that you are sitting on each of the benches at each stop, the sunflower faces will be toward you. I know this because the faces will be toward the east in the morning, toward the top/front during the afternoon and toward the west in the late afternoon. You would need to sit opposite them in order to see the faces.

Other information teacher teams might find useful when preparing to use this task in the TCT process

Some considerations for preparing to use this task would be to decide how you want to present this task to students. Teachers may use a variety of teaching strategies including whole-group, pairs, small group or a combination. Teachers could also choose to begin

the lesson with a QFT (Question Formulation Technique) by presenting students with a picture of sunflowers facing the sun and allow students time to compose open-ended and closed questions to engage their curiosity.

Extensions and/or other uses after the task is implemented

If time and resources are available, students may choose to either take sunflower seeds home to plant or with guidance of teacher, plant them in school garden. Students can record their observations in journals as they observe the plant's growing patterns.

Through Course Task – Sunflower Salutations

Name_____ Date_____

How exciting! A brand new park is opening in Pikeville. The name of the park is **Sunflower Sanctuary** because the park owner's favorite flower is the sunflower. Mr. Jones, the park owner, wants visitors to be able to enjoy a full day at the park. He desires for the park to have one unique feature that would make his park extra special. He would like all visitors to be able to see the beautiful sunflower faces throughout their visit to Sunflower Sanctuary.

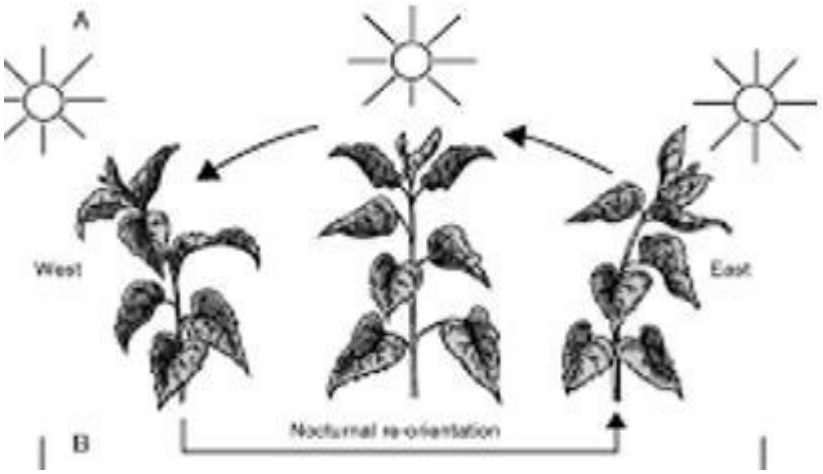
Sunflowers are unique plants. Not only do they provide bird seed and healthy snacks for humans, they also behave differently than most other plants.

*Let's take a look at sunflowers by watching a video titled ***The Mystery Of Why Sunflowers Turn To Follow The Sun — Solved***

While watching the video, look for a relationship between the sunflower and the apparent motion of the sun.

Record your observations ...write/sketch...	
Sun	**Sunflower**
How are the sun and sunflower alike? **How are they different?**	

Observe the diagram below:



Model of sunflower behavior

Information from the Diagram	Information from the Video

Compare the information provided in the sunflower model above and the information you observed in the video about sunflowers to answer the following questions:

1. What information does the video provide that the diagram does not?

2. What information does the diagram provide that the video did not?

3. What common information do both of these resources share?

4. Based on the information you have gathered, what is the relationship between the sun and sunflowers?

Name _____ Date_____

MAP OF SUNFLOWER SALUTATION PARK

Mr. Jones is so fascinated with sunflowers that he wants to create a Sunflower Tour for visitors at the park. Jones envisions a path through the park that has benches in the perfect locations so that visitors can sit and enjoy a view of the sunflower faces at each of the planned stops along the park path.

Here is the criteria that the Sunflower Tour path must include:

- ***The tour includes at least three stops near sunflower patches.***
- ***While sitting on the bench at each stop, visitors will see the faces of the sunflowers.***

Directions: Using your understanding of the relationship between sunflower behaviors (the way they turn throughout the day) and patterns of the sun (appears to rise in the east and set in the west), review the proposed plans to determine which path meets the criteria set by Mr. Jones. **You will need a copy of each of the proposed maps**.

Hint: ***Look for location of benches compared to the time of the stop and use your understanding of how the sun moves throughout the day to help you decide which of the maps would result in the vision Mr. Jones desires for the Sunflower Tour.***

This table is provided to assist you as you review each of the maps.

Criteria	Map A	Map B	Map C
Tour includes at least three stops near sunflower patches			
While sitting on the bench, you see the faces of the sunflowers			

Based upon your knowledge of the apparent motion of sun and sunflower behavior, which map best meets the criteria for the Sunflower Tour?

_____

Support your answer with evidence you gathered throughout this task (video, t-chart, notes, etc.)

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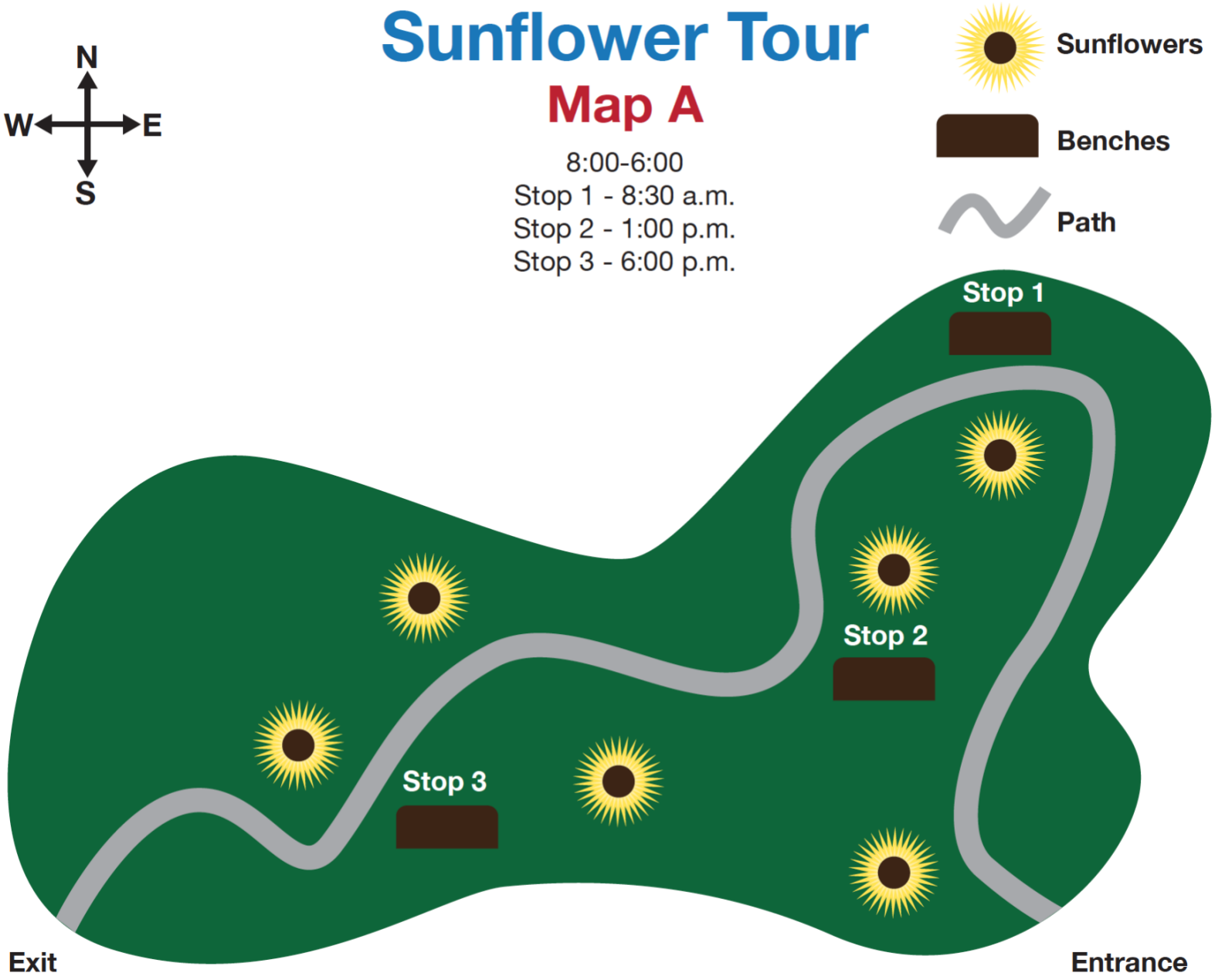
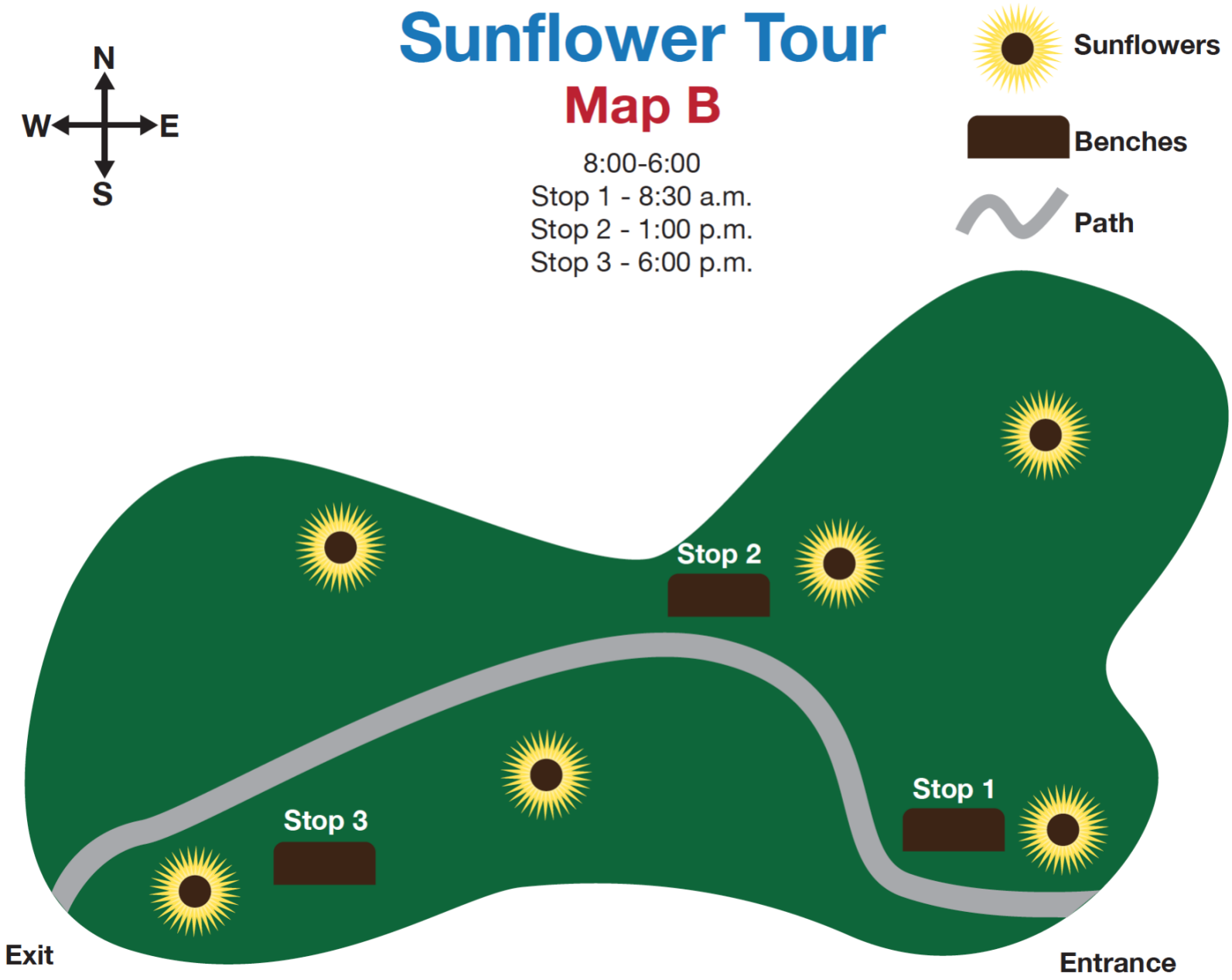
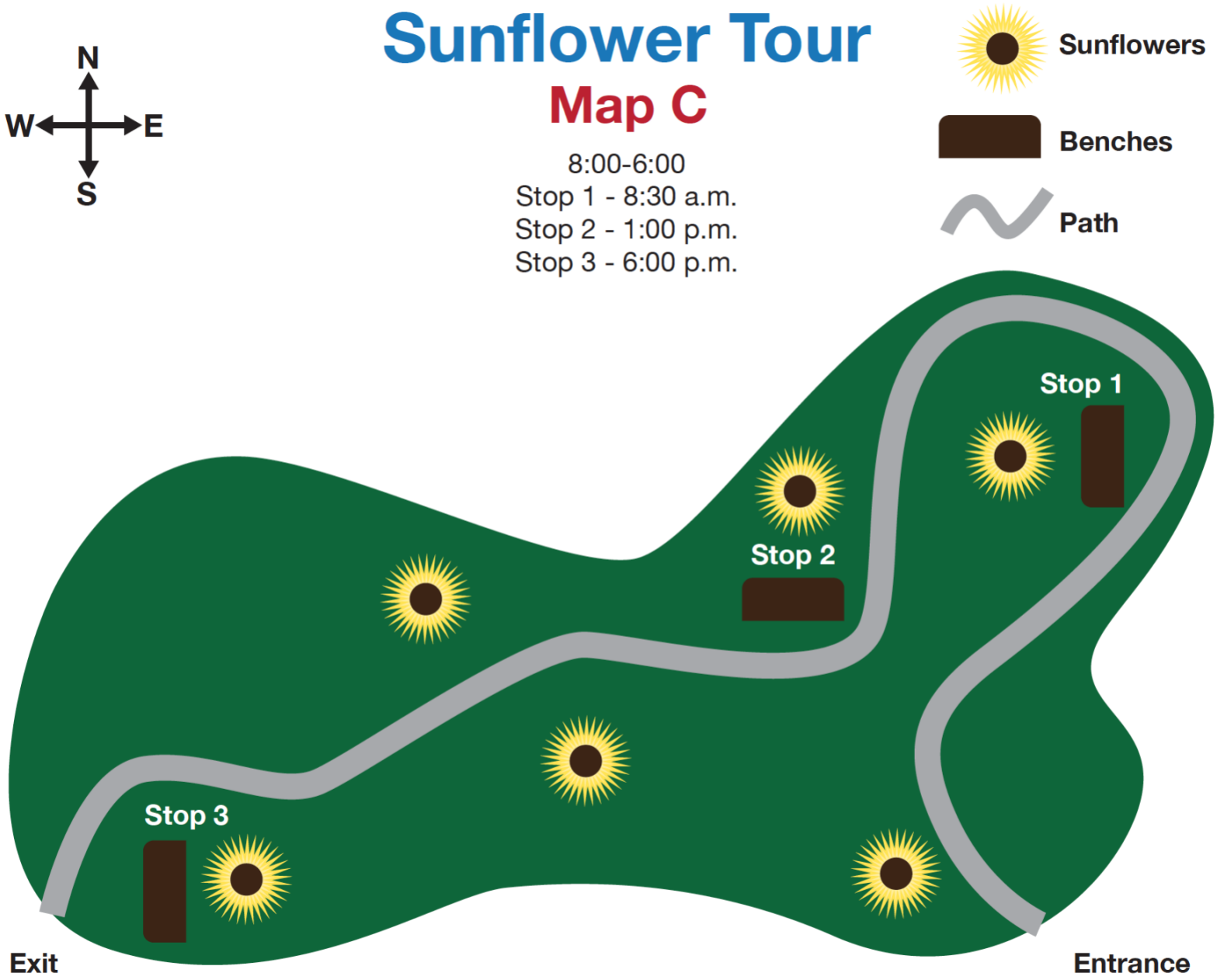

Sunflower Tour
Map A
8:00-6:00
Stop 1 - 8:30 a.m.
Stop 2 - 1:00 p.m.
Stop 3 - 6:00 p.m.
N
W
E
S
Sunflowers
Benches
Path
Stop 1
Stop 2
Stop 3
Exit
Entrance


Sunflower Tour
Map B
8:00-6:00
Stop 1 - 8:30 a.m.
Stop 2 - 1:00 p.m.
Stop 3 - 6:00 p.m.
N
W
E
S
Sunflowers
Benches
Path
Stop 2
Stop 1
Stop 3
Exit
Entrance


Sunflower Tour
Map C
8:00-6:00
Stop 1 - 8:30 a.m.
Stop 2 - 1:00 p.m.
Stop 3 - 6:00 p.m.
N
W
E
S
Sunflowers
Benches
Path
Stop 1
Stop 2
Stop 3
Exit
Entrance