

Hazard Literacy Center

Hazard Literacy Education Program

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Finding the Best Spots for Colling Shelters in Town



1. Program Overview

This program is a project-based educational program centered on spatial analysis. As heat waves become more intense and frequent due to the recent climate crisis, students explore places where they can escape extreme heat within their local area and propose suitable locations for cooling shelters based on students' daily activities and needs. Students first understand the concept and role of cooling shelters and analyze the locations and facility types of existing cooling shelters shown on the Life Safety Map. They then identify places students actually use and their major travel routes outside of school and home, compare them with the distribution of existing cooling shelters, and explore potential locations for cooling shelters that would be suitable for students. The activities consist of four stages: understanding heat waves and the urban heat island effect; identifying existing cooling shelters using the Life Safety Map; exploring potential cooling shelter locations based on students' daily activity areas; and evaluating potential locations and proposing new cooling shelters. Using tablets, students explore the Life Safety Map and information about surrounding areas. In groups, they mark existing cooling shelters, places students frequently use, and major travel routes on large paper maps to analyze their spatial relationships. They then evaluate potential locations in terms of accessibility, student usability, and feasibility, propose one to three locations as a group, and finally vote as a class to select the most suitable location for a cooling shelter. Through this process, students learn that heat waves are not simply weather phenomena and that their impacts can vary depending on urban environments and patterns of human activity. Students also gain experience in spatially analyzing problems in their own communities and proposing possible solutions.

Grade Level	Upper Elementary or Middle School Students	Instructional Methods	Group project activities
Learning Environment	Classroom with Access to Internet	Duration	4 sessions, 180 minutes
Required Materials	4 sessions, 180 minutes		

2. Learning Objectives (Hazard Literacy Framework)

① Understand the relationship between heat waves and the urban heat island effect and explain how heat waves affect the living environment.
② Analyze existing cooling shelters and students' daily activity areas using the Life Safety Map and spatial information.
③ Select locations for additional cooling shelters by considering students' daily activities and spatial conditions.

Learning Objectives	Knowledge & Understanding		Reasoning & Skills					Values & Attitudes			Psychology & Emotion			Behavioral & Practical Engagement		
	A1	A2	B1	B2	B3	B4	B5	C1	C2	C3	D1	D2	D3	E1	E2	E3
Objective ①	O	O	O					O								
Objective ②				O	O		O								O	
Objective ③		O	O	O		O				O		O		O	O	O

3. Key Concepts

- The definition and characteristics of heatwaves
- The relationship between heatwaves and urban heat islands
- The concept and role of cooling shelters
- How to analyze spatial information using a community safety map
- The process of spatially analyzing a local problem and proposing a solution

4. Program Sequence

	Activity Sequence
Introduction	-Understand the risks of heat waves through news reports and cases of heat-related illnesses. -Recall personal experiences by asking, “Where do you go to escape the heat besides school and home on a hot day?” -Understand the urban heat island effect and differences in heat-wave risk across urban spaces. -Introduce the inquiry question: “Are there enough cooling shelters that students at our school c an use?”
Inquiry 1	-Learn about the concept and role of cooling shelters and understand why they are needed during heat waves. -Use tablets to explore the Life Safety Map and identify cooling shelters near the school. -Classify cooling shelters as “Public Facilities” or “Facilities for Specific Groups” and mark them on a paper map.
Inquiry 2	-Think about places where students actually go to escape the heat besides school and home, and share ideas. -Visualize students’ major travel routes and daily activity spaces on a large paper map. -Examine the spatial relationships between existing cooling shelters, students’ daily activity spaces, and travel routes. -Select potential locations for additional cooling shelters, mark them on the map, and explain the reasons for selecting them.
Inquiry 3	-Use tablets to examine spatial information around each potential location, such as nearby facilities, roads, and green spaces. -Compare the advantages and limitations of each location and select one to three final locations as a group. -Organize the reasons for selecting each location and its expected benefits, and prepare a proposal for a new cooling shelter.
Conclusion	-Present each group’s one to three selected locations and cooling shelter proposal. -Compare and discuss the reasons each group selected its locations. -Vote for the most suitable location based on accessibility, student usability, and feasibility. -Review the voting results and select the class’s final proposed location for a cooling shelter.

5. Theoretical Background and Activity Design for Disaster Education

As the frequency and intensity of heat waves increase due to climate change, heat waves are increasingly recognized as a major hazard that requires responses in everyday life. The IPCC reports that human-induced climate change has made extreme heat events more frequent and intense across most land regions (IPCC, 2021). In addition, WMO (2023) points out that climate change is increasing the frequency and intensity of heat waves and that heat waves are developing into compound risks that can worsen air quality and cause further damage to human health and ecosystems. In Seoul, the annual average number of heat-wave days is projected to increase to as many as 110 days by the late 21st century under the SSP5-8.5 scenario (Yoo et al., 2023), making heat-wave response an increasingly urgent issue at the local level.

In urban areas in particular, urbanization, artificial structures, and reductions in green space and evapotranspiration are associated with the urban heat island effect, while urban spatial structures can influence exposure and vulnerability to climate-related heat risks (IPCC, 2022). In Seoul, heat-wave hotspots have shown a tendency to remain concentrated over time in particular districts, including Nowon-gu, Dobong-gu, and Gangseo-gu. This pattern is closely associated with urban spatial characteristics such as a high proportion of impervious surfaces and a lack of green space (Nam et al., 2025). Therefore, heat waves should not be understood simply as meteorological phenomena. It is also necessary to examine how urban environments and the spaces in which people live influence both the impacts of and responses to extreme heat.

Accordingly, this program is designed to help students explore spaces for responding to heat waves within their own daily activity areas. Students first learn about the concept and role of cooling shelters and use the Life Safety Map to identify the locations and facility types of existing cooling shelters near their school. In particular, they classify cooling shelters into public facilities and facilities for specific groups to examine how existing cooling shelters are spatially distributed.

Students then identify places they actually use to escape the heat outside of school and home, as well as their major daily activity spaces and travel routes, and compare these with the distribution of existing cooling shelters. In groups, students mark existing cooling shelters, their daily activity spaces, and travel routes on large paper maps. Based on this information, they select one to three potential cooling shelter locations that would be suitable for students. They then use tablets to examine the facilities and environment surrounding each location and evaluate its suitability based on accessibility, student usability, and feasibility.

Finally, each group prepares and presents a cooling shelter proposal based on its selected locations and reasons for selection. Students then vote for the most suitable location by considering accessibility, student usability, and feasibility, and select a final cooling shelter location for the class. Through these activities, students gain experience in using spatial information from their actual daily environments to make decisions about the location of disaster-response spaces and in spatially analyzing local problems to propose possible solutions.

6. Instructional Considerations

When teaching this program, guide students not to understand heat waves simply as a phenomenon of rising temperatures but to consider how the urban heat island effect and urban environments influence the impacts of extreme heat. However, rather than focusing on an in-depth analysis of the urban heat island effect itself, encourage students to use this concept as a basis for thinking about spaces where they can escape extreme heat in the areas around their school.

During the Life Safety Map activity, guide students to accurately identify the locations and facility types of cooling shelters. Students should distinguish between “Public Facilities” and “Facilities for Specific Groups,” but they should not automatically assume that facilities for specific groups are places that students cannot use. Since actual accessibility may vary depending on the characteristics and operating policies of each facility, explain that students need to consider whether each space is appropriate and accessible for their use.

When analyzing students’ daily activity areas, encourage them to freely identify places outside of school and home that they actually use or believe could provide relief from the heat. Students may suggest a variety of places, such as convenience stores, libraries, youth facilities, and commercial facilities. Guide them to connect their personal experiences with spatial information and represent these places on the map.

During the site-selection process, guide students not to select locations simply because they are nearby or because they personally like them. Instead, encourage them to compare potential locations based on accessibility, student usability, and feasibility. Students should use tablets to examine the facilities and environments surrounding each location. On the large paper map, they should gradually add existing cooling shelters, students’ daily activity spaces, travel routes, and potential locations so that they can identify spatial relationships among the different types of information.

Finally, when groups present their proposed locations and the class votes, ensure that the activity does not become a simple popularity vote. Guide students to make decisions based on the three site-selection criteria. Ultimately, students should experience the process of identifying and selecting an appropriate space for responding to extreme heat within their own daily activity areas.

7. References

- Nam, Y. K., Lee, D. K., & Park, C. Y. (2025). Spatiotemporal identification of heatwave hotspots in Seoul using Google Earth Engine and Landsat imagery. Journal of Climate Change Research, 16(5-1), 935–948. https://doi.org/10.15531/KSCCR.2025.16.5.935
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- IPCC. (2021). Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press.
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Session 1: Why Are Heat Waves Dangerous?

Topic	Understanding the Risks of Heat Waves and the Urban Heat Island Effect
What Will We Learn?	① Explain the causes and characteristics of heat waves and the urban heat island effect. ② Explain the relationship between heat waves and the urban heat island effect.

1 Think About It

- When was the last time you experienced extremely hot weather?
- Where were you at the time, and what made the heat especially difficult for you?

2 Understanding Heat Waves

- A heat wave is not simply a period of hot weather. It can become a hazard resulting from the combined effects of climate conditions and the urban environment.
- Answer the following questions to better understand heat waves and the urban heat island effect.

1) What do you think a heat wave is?

2) What is the urban heat island effect?

3) How are heat waves and the urban heat island effect related?

Session 2: Exploring Cooling Shelters in Our Neighborhood

Topic	Identifying the Locations and Types of Cooling Shelters
What Will We Learn?	① Use the Life Safety Map to identify cooling shelters near our school. ② Identify different types of cooling shelters and mark their locations on a map. ③ Compare the distribution of existing cooling shelters with places students frequently use and describe the patterns you find.

1 Learning About Cooling Shelters

What Is a Cooling Shelter?

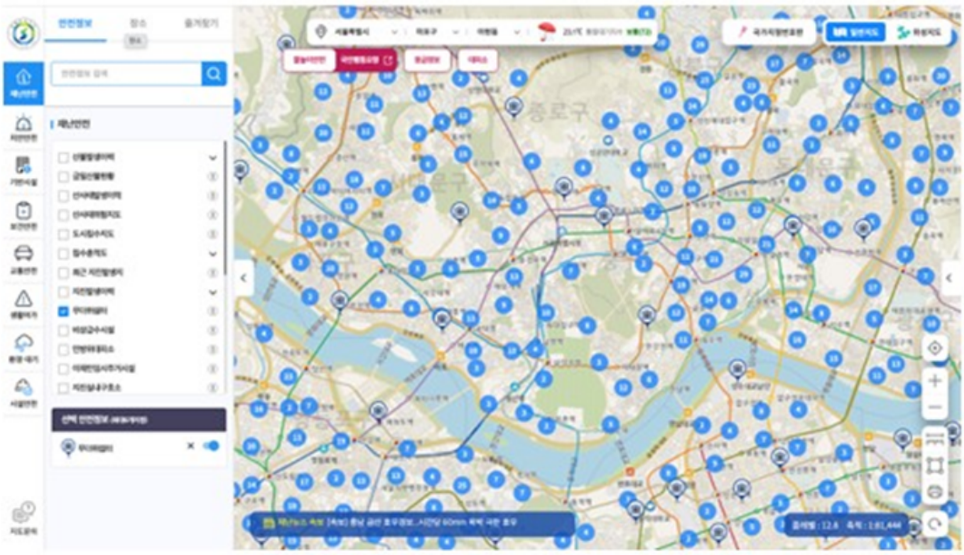
A cooling shelter is a designated space where people can escape the heat and rest during a heat wave.

1) Have you ever visited a cooling shelter or seen one in your neighborhood?

2) What kinds of places do you think are used as cooling shelters?

2 Exploring Cooling Shelters Using the Life Safety Map

- Scan the QR code below with your tablet to open the Life Safety Map.
- Click "Cooling Shelters" and find cooling shelters near your school and in places you frequently visit.
- Click each shelter to check information such as its category and capacity, and complete the table below.



Cooling Shelter Name	Facility Type (Category)	Capacity (People)
	Public Facility / Facility for Specific Groups / Private Facility	
	Public Facility / Facility for Specific Groups / Private Facility	
	Public Facility / Facility for Specific Groups / Private Facility	
	Public Facility / Facility for Specific Groups / Private Facility	
	Public Facility / Facility for Specific Groups / Private Facility	

1) Which type of cooling shelter is most common in the areas you frequently visit?

☐ Public Facility ☐ Facility for Specific Groups ☐ Private Facility

2) Do all cooling shelters have similar capacities, or are they different?

3) Write down something new you learned or a question you have after exploring the cooling shelters.

3 Creating a Map of Cooling Shelters Near Our School

- Mark the cooling shelters you investigated on the map, using different symbols for each type.
- In addition to your school and home, mark places you frequently visit during the summer.

Legend

● Cooling Shelter (Public Facility)

▲ Cooling Shelter (Facility for Specific Groups)

■ Cooling Shelter (Private Facility)

★ Places Frequently Used by Students

(e.g., academies, places to meet friends, convenience stores, bus stops)



Look at the map and answer the questions.

1) Is there a cooling shelter near a place you frequently visit?

☐ Yes ☐ No ☐ Not Sure

2) What type of facility is the nearby cooling shelter?

☐ Public Facility ☐ Facility for Specific Groups ☐ Both ☐ There is no cooling shelter nearby

3) Based on the map, select what you learned about cooling shelters near our school.

☐ There are cooling shelters near places students frequently visit.

☐ There are not enough cooling shelters near places students frequently visit.

☐ Nearby cooling shelters are often facilities for specific groups.

☐ There are cooling shelters in public facilities that students can use.

☐ Other: _____

Session 3: Selecting a Location for a Cooling Shelter

Topic	Selecting a Suitable Location for a Cooling Shelter
What Will We Learn?	① Identify potential locations for cooling shelters by considering the places students frequently use near the school. ② Use maps and information about nearby facilities to evaluate the accessibility and usability of each potential location. ③ Compare several potential locations and select the most suitable location for students.

1 Where Is a Cooling Shelter Needed?

- Based on the places you identified on the map in Session 2, find locations that students frequently use but where there are not enough cooling shelters available to students.
- Consider places such as libraries, community centers, youth centers, areas near transportation facilities, and public facilities near schools.

Potential Location	Reason for Selecting This Location

2 Exploring the Area Around Each Potential Location

- Use an online map on your tablet to examine the facilities and environment around each potential location.

① Accessibility

- Is it easy to get there from school?
- Is it close to places students frequently visit?
- Is it easily accessible by major roads or public transportation?

② Student Usability

- Is it a place that students frequently use or visit?
- Are there facilities or spaces that students can use freely?
- Are there public facilities or other useful facilities nearby that students can use?

③ Feasibility

- Can an existing building or facility be used?
- Is there an indoor space that could be used as a cooling shelter?
- Are there currently too few cooling shelters available nearby?

3 Comparing Potential Locations

- Compare the potential locations using the following criteria.

Evaluation Criteria	Location ①	Location ②	Location ③
Is it easily accessible to students?	☆☆☆	☆☆☆	☆☆☆
Is it close to places students frequently visit?	☆☆☆	☆☆☆	☆☆☆
Could the location be used as a cooling shelter?	☆☆☆	☆☆☆	☆☆☆

☆☆☆ Highly Suitable ☆☆ Suitable ☆ Fair

4 Selecting Our Group's Final Location

- Based on your findings above, select one location that your group would recommend for a cooling shelter and briefly explain why.

5 Cooling Shelter Proposal

- Create your group's proposal for a new cooling shelter.

- Proposed Location:
- Why is a cooling shelter needed here?

  1)

  2)

  3)

- Benefits of installing a cooling shelter here:
- Our Idea for the Cooling Shelter:

Session 4: Selecting Our Class's Cooling Shelter Location

Topic	Deciding on the Best Location for Our Class's Cooling Shelter
What Will We Learn?	① Listen to each group's cooling shelter proposal and identify the characteristics of each potential location. ② Compare the locations proposed by each group based on accessibility, student usability, and feasibility. ③ Vote to select the most suitable location for a cooling shelter for students.

1 Reviewing Other Groups' Proposals

- Listen to each group's proposed location and evaluate it.

Group	Potential Location	Accessibility	Student Usability	Feasibility
Group 1		☆☆☆	☆☆☆	☆☆☆
Group 2		☆☆☆	☆☆☆	☆☆☆
Group 3		☆☆☆	☆☆☆	☆☆☆
Group 4		☆☆☆	☆☆☆	☆☆☆
Group 5		☆☆☆	☆☆☆	☆☆☆

2 My Final Choice

- Which location did you choose, and why?

- What did you learn or realize through this activity?