

FIELD INVESTIGATIONS AND ACTIVITIES

Science learning experiences occur in the classroom, in the laboratory, and in the field. Through these experiences, students discover facts, concepts, and laws of science, much as scientists do in their professional lives. Field investigations provide students with first-hand experience by allowing them to explore, observe, and investigate natural-world phenomena that cannot be brought into the classroom learning environment. Direct observation in a field setting can provide a stimulating and rewarding experience for the students and the teacher. However, field experiences require materials and procedures in order for students to experience various facets of the natural world. In addition, safety guidelines must be maintained to ensure a productive experience for all participants.

“School districts should develop and implement safety procedures for laboratory investigations and field trips. Teachers should learn safe procedures for laboratory activities and field trips and follow them as a matter of policy.”

NSTA: *Field and Laboratory Liability*, 1985

WHAT IS A FIELD INVESTIGATION?

Field experiences or investigations are an integral part of any science program. The importance and relationship of field investigations to the curriculum of the natural sciences cannot be minimized and, in many cases, is essential for the application of key concepts. Significant gains in learning may be achieved only through field experiences in some instances.

Field investigations take students out of the school setting and into industries, universities, governmental agencies, arboretums, zoos, museums, and natural areas to discover the applications of science in technology and research. Career awareness is an important result of these experiences.

A field experience may have several purposes and serve a variety of instructional objectives.

Field investigations should

- contribute to the understanding of science concepts in the natural world,
- allow students to experience what real scientists do,
- provide an opportunity to collect real data,
- model real applications of science, and
- connect science disciplines to future careers.

Experiences gained during a field investigation can motivate students to learn more about what they have observed and can serve to bridge the gap between the written text and the actual experiences of working in a natural setting.

The Texas Essential Knowledge and Skills for Science require students in Kindergarten–Grade 8 to conduct science investigations in the classroom, laboratory, and field. In Grades 9–12, laboratory and field investigations are to comprise at least 40% of their instructional time.

How Do You Plan for a Field Investigation?

Emphasize safety on any field excursion. Teachers and administrators should consider the following recommendations prior to student participation in fieldwork. This list was adapted from Manitoba Education and Training's *Science Safety: A Kindergarten to Senior 4 Resource Manual for Teachers, Schools, and School Divisions*, April 1997.

Why are you planning this excursion?

- ☼ Does the science activity support what the students are learning in the state science standards?
- ☼ Are the activities connected to learning experiences?

When do you plan to take the excursion?

- ☼ Is there adequate time to plan this trip?
- ☼ Will relevant information be provided to students before the investigation occurs?
- ☼ Is there adequate time after the trip to do a wrap-up or analysis?
- ☼ Are there any potential conflicts with the selected date?
- ☼ Does the selected date indicate the need for special clothing or supplies?
- ☼ Is there a contingency plan for inclement weather conditions?

What do you expect your students to learn from this experience?

- ☼ Have you established objectives for this field investigation?
- ☼ Have you selected appropriate activities and instructional approaches?
- ☼ Have you and your students completed background research?
- ☼ Will students be required to complete a project on the trip?
- ☼ Are your expectations about student behavior clear and realistic?

How are you going to get to the site?

- ☼ Will transportation be required?
- ☼ Is appropriate transportation both available and affordable?
- ☼ Can the students actively engage in learning during the trip to the site?

Where do you plan to go with your class?

- ☼ Is the site accessible to all students?
- ☼ Is the permission of landowners or officials required in order to visit this site?
- ☼ Is there an admission fee?
- ☼ Does the site have facilities such as bathrooms, lunch areas, shelters, and meeting space?
- ☼ Are there appropriate emergency facilities nearby?
- ☼ Is it possible for the teacher to visit the site before the field investigation?

What safety precautions are required?

- ☼ Do you have adequate first-aid kits readily available?
- ☼ Do you have fire prevention equipment?
- ☼ Will students be given additional safety training before the trip?
- ☼ Is a cellular phone available for making emergency calls?
- ☼ Are copies of the permission and medical forms with the teacher?

How long will this trip take?

- ☼ Can time be used efficiently?
- ☼ Is there too much to do in the time available?
- ☼ Is time provided for students to relax?

What is the effect on the rest of the school?

- ☼ Will someone have to cover your other classes?
- ☼ Will a substitute be required?
- ☼ Will others have to change their planned activities?
- ☼ Will students miss other important events or activities while on the field investigation?

Who is helping you supervise the students during the field investigation?

- ☞ Have group supervisors been identified?
- ☞ Has the class been divided into teams or working groups?
- ☞ Are there enough supervisors for the number of students and the activities?
- ☞ Are there parents with expertise who could be present during the field investigation?

Have parental consents been received for each student?

- ☞ What forms are necessary for parents to give consent and provide emergency information?

Has the trip been approved by the appropriate administrators?

- ☞ Do you know the district's procedure for getting approval for field investigations?
- ☞ Have the appropriate administrators given their approval?
- ☞ Is additional insurance needed?

Do any students have special health concerns?

- ☞ Have you talked with the school nurse to determine whether any students have specific health concerns?
- ☞ Are there any students who may need to take medication while on the trip?

Have you discussed the following safety precautions with the students?

- ☞ Wearing proper clothing and shoes
- ☞ Using insect repellent
- ☞ Identifying poisonous plants
- ☞ Preventing overexposure to the sun
- ☞ Taking drinking water to prevent dehydration
- ☞ Reporting and responding to accidents
- ☞ Using a buddy system

Have you made plans to evaluate the field investigation?

- ☞ Will sponsors give feedback about the successes of the trip?
- ☞ Will students have an opportunity to evaluate the field trip?

Have you included these items in a parental consent letter?

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| ✓ Which students are going and how many | ✓ Types of activities planned | ✓ Anticipated costs, payments due |
| ✓ Purpose of the excursion | ✓ Names of teachers and supervisors | ✓ Risks involved |
| ✓ Educational opportunities the trip offers | ✓ Special skills of supervisors | ✓ Description of contingency plan |
| ✓ Destination of the trip | ✓ Clothing requirements | ✓ Due date for permission forms |
| ✓ Method of transportation | ✓ Lunch plans, meal arrangements | ✓ Due date for medical information forms |
| ✓ Time and date of departure | ✓ Required materials and supplies | ✓ Time, place for planning meeting with parents |
| ✓ Time and date of return | | |

Additional information concerning preparations for field investigations can be found in Appendix E.

WHAT SHOULD BE DONE UPON ARRIVAL AT THE SITE?

Once you have arrived, give students specific information concerning safety before any work begins.

Do the students understand what is expected of them?

- ☼ Have students been given clear objectives and expectations?
- ☼ Do they know the timelines for their projects?
- ☼ Do they know who will be in their group and who their supervisor will be?
- ☼ Does everyone have a buddy, and has the teacher established periodic checks?

What should students do if an accident occurs?

- ☼ Do students understand the procedures for reporting accidents?

- ☼ Do students know where the teachers and supervisors will be located?
- ☼ Does everyone know where the first-aid kit is located and who is authorized use the kit?

Has the use of safety equipment been reviewed?

- ☼ Has the use of safety equipment been reviewed with the students and supervisors?
- ☼ Do students know where personal safety equipment is located, such as safety goggles?

Are students aware of any on-site hazards?

- ☼ Have they identified any poisonous plants?
- ☼ Have they taken precautions against insect bites?

WHAT AWAITS STUDENTS AT THE SITE?

Poisonous plants are a common hazard that students and supervisors may encounter when on a field trip in a natural area. Coming into contact with poisonous plants can cause allergic reactions, dermatitis, or ingestion reactions.

Some of the most common poisonous plants are poison ivy (*Toxicodendron radicans*), poison oak (*Toxicodendron quercifolium*), and poison sumac (*Toxicodendron vernix*). (See Appendix E for a listing of other poisonous plants). Each of these plants can cause severe dermatitis—itching and oozing sores, swelling of the throat and mouth, weakness, and fever. The degree of plant poisoning can range from minor skin irritation to long-lasting inflammation or blisters, depending on the person's sensitivity to the poison.

To help reduce the chance of infection, students should always wash with soap and water to remove the plant oils immediately after returning from a field experience.

Students who are sensitive to these plants should take a change of clothing to reduce the probability of reaction.

Allergies are the result of an individual's sensitivity to airborne materials such as algae, fungus spores, and pollen grains. It is probably impossible to protect students from allergies. Hay fever, asthma, and other allergy-related respiratory diseases can cause serious complications, so teachers should identify students who suffer from these reactions prior to the field trip. The teacher should carry medications sent by the parents so they can respond immediately if a student has an allergic reaction.

Many plants are highly toxic when ingested. Poisoning may result from ingesting seeds, fruits, stems, leaves, flowers, etc., from the plant. The state of the plant's growth, its size, the physical condition of the individual person, and the

time of year can affect the seriousness of the poisoning.

The National Science Teachers Association's publication *Safety in the Secondary Science Classroom* provides a valuable set of standards for how to work with plants in the laboratory and what to do upon encountering unknown plants in the field.

1. *Never eat unknown berries, seeds, fruits, or other plant parts.*
2. *Never rub any sap or fruit juices onto the skin or into an open wound.*
3. *Never inhale or expose your skin or eyes to the smoke of any burning plant.*
4. *Never pick strange wildflowers or cultivated plants unknown to you.*
5. *Never eat food after handling plants without first scrubbing your hands with soap and water.*

In the event that a student ingests a plant and becomes ill, use the following procedure to prevent a more serious condition from occurring.

1. Call the physician listed on the student's emergency information form or call a local doctor if the student's physician is unavailable.
2. Be prepared to provide the doctor with the following information:
 - ☼ name of the plant (if unknown, collect samples)
 - ☼ a complete description of the plant
 - ☼ when the student ate the plant
 - ☼ student's age, weight, height
 - ☼ symptoms the student is exhibiting
 - ☼ what part of the plant and how much was ingested
3. Be prepared to transport the student to the nearest hospital.

Plants that are known to be poisonous when ingested are blue-green algae that "bloom," or become very prominent, in polluted water. Also, many species of "toadstools" (mushrooms) are poisonous. It is very

difficult to distinguish the edible varieties from the poisonous ones. Some of the more common poisonous mushrooms include *Amanita*, *Clitocybe*, *Lactarius*, *Lepiota*, and *Russula*.

When ingested, these poisonous varieties can cause extreme abdominal pain and vomiting, loss of muscular coordination, and hallucinations. It is extremely important to identify accurately the ingested plant so that proper treatment can be administered.

In addition to plants and fungi, a variety of animals—insects, snakes, and mammals—may be hazardous to some students. Teachers need to know which of their students might react to insect bites and to be prepared to take immediate action. Long-sleeved shirts and blouses may reduce the chance of bites and stings from mosquitoes, ticks, mites, and chiggers. Additional precautions, such as using insect repellents, may further reduce the probability of insect bites.

The threat of snakebites is a serious problem in some areas of the state. In Texas, the venomous snakes include rattlesnakes, copperheads, cottonmouths, and coral snakes. The handling of any snake should be discouraged, and students should never attempt to handle venomous snakes.

Studying natural phenomena in the field is an important part of science instruction. It helps students to make the connection between what they study in the classroom and what occurs in the natural world. Direct observations and investigations can motivate students to go beyond classroom instruction, and the knowledge they acquire in this way may never be forgotten.

SEVERE WEATHER SAFETY GUIDELINES

Severe weather can occur quickly and without warning. It is important for teachers to follow the recommended safety guidelines if severe weather should develop during a field investigation. The National Oceanographic and Atmospheric Administration (NOAA) has developed the *Severe Weather Safety Guide*. The following recommendations have been adapted from NOAA's guidelines.

TORNADO SAFETY

Tornadoes are among the most violent atmospheric phenomena on the planet and can generate winds of 200–300 m.p.h. The following are instructions for what teachers and students should do when a tornado threatens to occur during a field investigation.

IN SMALL BUILDINGS

Go to the basement (if available) or to an interior room on the lowest floor, such as a closet or bathroom. Wrap yourself in overcoats or blankets to protect yourself from flying debris.

IN SCHOOLS, HOSPITALS, OR FACTORIES

Go to interior rooms and halls on the lowest floor. Stay away from glass-enclosed places and areas with wide-span roofs, such as auditoriums and warehouses. Crouch down and cover your head with your hands.

IN HIGH-RISE BUILDINGS

Go to small interior rooms or halls. Stay away from exterior walls and glassy areas.

IN CARS OR SCHOOL BUSES

Abandon them immediately!! Most deaths from tornadoes occur in cars. If you are in a car or school bus, leave the vehicle and go to a substantial structure or designated shelter.

IF NO SUITABLE STRUCTURE IS NEARBY

Lie flat in the nearest ditch or depression and use your hands to cover your head.

FLASH FLOOD SAFETY

Floods and flash floods are the number one weather-related killer, causing at least 140 deaths in the U. S. each year. Floods can occur quickly and be extremely dangerous to anyone on a field investigation.

INSIDE

If ordered to evacuate, or if water is rising, leave immediately and get to higher ground.

OUTDOORS

- ☼ Go to higher ground immediately! Avoid small rivers and streams, low spots, canyons, dry riverbeds, etc.
- ☼ Do not try to walk through flowing water that is more than ankle deep.
- ☼ Do not allow students to play in streams, drainage ditches or viaducts, storm drains, or other flooded areas.

IN A VEHICLE

Do not drive through flooded areas!

The majority of deaths caused by flash flooding are due to people driving through flooded areas. Water only one foot deep can displace 1500 pounds. Two feet of water can EASILY carry most automobiles. Roadways concealed by floodwaters may not be intact.

LIGHTNING SAFETY

Do you know what to do if you are caught in the open during a thunderstorm, or if you feel a tingling or your hair standing on end? Lightning causes around 100 deaths in the U. S. annually (more than hurricanes and tornadoes combined). Even if no rain is falling, lightning can strike up to several miles away from a thunderstorm.

OUTDOORS

If lightening occurs during a field investigation, go to a safe shelter immediately, such as the inside of a sturdy building. A hard-top automobile or school bus with the windows up can also offer fair protection.

If you are in a boat or swimming, get out of the water immediately and move to a safe shelter away from the water. If you are in a wooded area, seek shelter under a thick growth of relatively small trees.

If you feel a tingling, or if your hair stands on end, squat with your head between your knees. Do not lie flat.

Avoid isolated trees or other tall objects, bodies of water, sheds, fences, convertible automobiles, tractors, and motorcycles.