Grade 3

Cluster 4: Soils and the Environment

Overview

Soil provides a base for gardens, forests, fields, and farms, supporting plant and animal life, and human activities. By examining soils, students discover that soil composition and characteristics vary. Students also experiment to determine the impact of different soils on plant growth, thus improving their understanding of scientific inquiry processes. Students also learn the importance of animals and nutrient recycling to soil quality. Teachers are encouraged to help students develop the strong connection between soils and plants (see *Grade 3, Cluster 1: Growth and Changes in Plants*).

PRESCRIBED LEARNING OUTCOMES	SUGGESTIONS FOR INSTRUCTION
Students will...	
3-4-01 Use appropriate vocabulary related to their investigations of soils in the environment. Include: soil, soil component, loam, clay, sand, pebbles, organic matter, humus, rocks, sedimentation, sieving, water-holding capacity. GLO: C6, D5	➢ Introduce, explain, use, and reinforce vocabulary throughout this cluster. ➢ **I Wonder Chart** Post lined chart paper that is entitled "Learning About Soils." Invite students to record questions about this topic. Students may record questions, words, or phrases at any time throughout this study. Review the chart to reinforce vocabulary and use the questions to focus inquiry and instruction.
3-4-02 Identify and describe various components within a sample of soil from the local environment. *Examples: clay, loam, sand, pebbles, organic matter, humus, rocks...* GLO: D5	➢ **What Do I Know About Soils?** To activate prior knowledge, have students brainstorm and list what they know (or think they know) about the composition of soil. ➢ **Composition of Soils** Place pure samples of soil components (clay, sand, humus) in the Soil Science Centre. Have students visit the centre and use their senses to describe each sample. They should use a magnifying glass to observe particle size. Have students record their observations in a chart like the following.

Composition of Soils

Component	Looks Like	Feels Like	Smells Like
clay	grey fine particles	soft	a pond
sand	golden different sized particles	rough	fresh/no smell
humus	black and brown different sized particles	crumbles	woodsy

The category "Sounds Like" may be added to the above chart (muffled, rattles, etc.).

Discuss the observations with the class and ask students to include observations made by their peers in their own charts. Completed charts can be placed in science journals for future reference.

3-0-1a. Ask questions that lead to investigations of living things, objects, and events in the local environment. (ELA 1.2.4) GLO: A1, C2, C5

3-0-5e. Record observations in a variety of ways. *Examples: point-form notes, sentences, simple diagrams, charts...* (ELA 3.2.1, 3.3.2, 4.1.3; Math SP-II.2.1, SP-V.2.3) GLO: C2, C6

TEACHER NOTES	SUGGESTIONS FOR ASSESSMENT
Cluster Note: This cluster has a strong link to Grade 3, Cluster 1: Plants. Teachers may wish to address portions of both clusters during a unit of study. This cluster also provides an excellent opportunity for students in rural areas to use agriculture as a focus. Contact your local Agriculture Manitoba office for resources and speakers.	
Encourage students to use the term "soil," rather than the less scientific term, "dirt." Soil has three main components: **Sand** — tiny fragments of rock (inorganic matter) that form the bulk of soil **Clay** — clay has much finer particles than sand **Humus** — decaying plant and animal matter (organic matter) Soil can also contain larger rock pieces called pebbles, gravel, or silt. **Silt** is another variation in the size of rock fragments, being finer than sand, but coarser than clay. **Loam** is a fertile mixture of clay, sand, and humus. Classroom soil samples can be created by combining the three components in various amounts and combinations and adding potting soil.	**Paper and Pencil Task: Composition of Soils** Identify the three main components of soil and describe the characteristics of each. The student identifies ❑ sand, clay, humus ❑ descriptive characteristics relating to the senses

PRESCRIBED LEARNING OUTCOMES

Students will...

3-4-03 Explore to determine ways to separate soil components.

Include: sedimentation and sieving techniques.

GLO: C2, D5

3-0-4a. Carry out a plan, and describe the steps followed. (Math SP-V.2.3) GLO: C2

3-0-4f. Assume roles and share responsibilities as group members. (ELA 5.2.1) GLO: C7

3-0-5b. Use tools to observe, measure, and construct. Include: ruler, metre stick, pan balance, magnifying glass, bathroom scale, thermometer, magnet. (Math SS-I.1.3, SS-III.1.3, SS-IV.1.3, SS-VII.4.3) GLO: C2, C3, C5

3-0-9c. Take the time to repeat a measurement or observation for greater precision or detail. GLO: C5

SUGGESTIONS FOR INSTRUCTION

➢ **Investigation: Separating Soil Components**

Sieving/Screening

Have students explore how to separate the components of soil using a variety of screening devices (sieves, colanders, screens). Provide, or have the students bring, different-sized screens, sieves, and colanders. Have students make and record predictions as to what they think will remain in the sieve before they begin to separate and analyze soil components. Have students work in small groups and record observations in their science journals.

Sedimentation

Demonstrate for students how to separate the components of soil, using sedimentation. Provide each pair of students with a small glass jar (baby food or juice bottle). Have students put soil in the container (1/3 to 1/2 full), fill with water, put the lid on, shake vigorously, and allow soil to settle. Have students draw and label, in their science journals, a diagram that describes each separated layer. Have students summarize their findings using the following frame:

This soil sample was made up of _____, _____, _____, _____, and _____.
I know this because
_____.

Use the following questions for discussion:

- Was sieving or sedimentation more effective in separating soil components? Why?
- When might people use sieving to separate soil?
- When might people use sedimentation to separate soil?
- Why might people want to separate soil components?

TEACHER NOTES

SUGGESTIONS FOR ASSESSMENT

Self-Reflection: Separating Soil Components

1. I liked _____
_____.
2. I had a problem with _____
_____.
3. If I did this activity again, I would _____
_____.
4. I learned _____
_____.
5. I would like to learn more about _____
_____.

PRESCRIBED LEARNING OUTCOMES

Students will...

3-4-04 Describe and compare components of soil samples collected at different locations and depths.

GLO: D5, E1

3-0-3a. Brainstorm, with the class, one or more methods of finding the answer to a given question and reach consensus on which method to implement. GLO: C2, C7

3-0-3c. Create, with the class, a plan to answer a given question. (ELA 3.1.4) GLO: C2, C7

3-0-4a. Carry out a plan, and describe the steps followed. (Math SP-V.2.3) GLO: C2

3-0-4h. Follow given safety procedures and rules, and explain why they are needed. GLO: C1

3-0-5a. Make observations that are relevant to a specific question. GLO: A1, A2, C2

3-0-5b. Use tools to observe, measure, and construct. Include: ruler, metre stick, pan balance, magnifying glass, bathroom scale, thermometer, magnet. (Math SS-I.1.3, SS-III.1.3, SS-IV.1.3, SS-VII.4.3) GLO: C2, C3, C5

3-0-7a. Draw a simple conclusion based on their observations. GLO: A1, A2, C2

SUGGESTIONS FOR INSTRUCTION

➢ **Investigating Soil Samples**

Have students collect both surface and below-the-surface soil samples from the school yard, home, neighbourhood, and beyond. Have students label the samples to identify their original location and depth. With students, decide on which method to use in order to separate soil components.

Surface

Have students work in pairs or small groups to analyze the surface samples and describe the components by using the senses of sight, touch, and smell. Encourage students to observe using a magnifying glass or microscope (if available). Have students record observations on a chart such as the one below.

Analyzing Soil Components

Location: Schoolyard

Depth	Observations	Components Identified
surface	_____	_____
below surface	_____	_____

Encourage students to look for signs of animals in their soil observations (link to 3-4-09).

Below the Surface

Have students analyze below-the-surface samples by following the same procedures they used for the surface samples. Students should add to their chart.

At the end of the learning experience, use the following focus questions for an analysis of the findings:

- Which component appeared most often? Least often?
- What did you discover about surface soil compared to soil below the surface?

TEACHER NOTES

Soil is usually layered. The **topsoil** or upper layer is where humus, plant roots, and living creatures will be found. The more humus, the richer the soil. The next layer, called **subsoil**, often contains a high percentage of clay and may lack organic matter.

SUGGESTIONS FOR ASSESSMENT

Self-Assessment of Observation Skills

I used the following senses to observe the soil samples:

- ❑ sight
- ❑ touch
- ❑ hearing
- ❑ smell

I used the following tools:

- ❑ magnifying glass
- ❑ microscope
- ❑ other _____

I observed the following things:

- ❑ colour
- ❑ size
- ❑ texture
- ❑ shape
- ❑ other _____

I recorded my observations using

- ❑ charts
- ❑ words
- ❑ diagrams
- ❑ other _____

PRESCRIBED LEARNING OUTCOMES

Students will...

3-4-05 Compare the water-holding capacity of different soils.

Examples: sandy soil retains far less water than loamy soil...

GLO: D3, D5, E1

3-0-1b. Make predictions based on observed patterns, collected data, or data provided from other sources. (ELA 1.1.1; Math SP-IV.2.3) GLO: A1, C2

3-0-5c. Estimate and measure mass/weight, length, volume, and temperature using standard units. (Math SS-IV.1.3, SS-I.1.3, SS-III.1.3, SS-VIII.4.3) GLO: C2, C3, C5

3-0-6a. Display data using more than one way to represent the same data. (Math SP-III.2.3) GLO: C2, C6

3-0-6b. Discuss data and generate new questions from displayed data. (Math SP-IV.1.2) GLO: A1, A2, C2, C5

SUGGESTIONS FOR INSTRUCTION

➢Activating Prior Knowledge

Use the following questions to stimulate thinking and generate discussion:

- When it rains, where does the water go?
- What happens if it rains for a very long time?
- What is absorption?
- Do all types of soils absorb the same amount of water?
- Why is absorption important?

➢Investigation: Observing the Amount of Water Soils Absorb

Have the students work in small groups using soil samples from previous investigations. Put the same amount of soil into styrofoam cups that have drainage holes at the bottom. Hold each cup over a plastic cup in order to catch the water as it drips through the soil. Have students predict which soil will absorb the most water and which will absorb the least.

Work with each sample in turn. Add 15 ml of water at a time until the water begins to drip through the bottom drainage hole. This shows that the soil has reached its saturation point, and cannot hold any more water. Record the amount of water that was added to the soil before it reached saturation. Allow the sample to remain undisturbed for a set time. Measure the amount of water that dripped from the cup and subtract this from the amount added to show how much water the soil absorbed.

Repeat the procedure with at least two different soil samples. Have students record the data on a chart.

Observing The Amount of Water Soils Absorb

Type of Soil	1.	2.	3.
Amount of water added	_____	_____	_____
Amount of water that dripped through	_____	_____	_____
Amount of water absorbed	_____	_____	_____

Have students graph their data, discuss the findings, and generate new questions.

TEACHER NOTES

In Grade 2, Cluster 2: Properties of Solids, Liquids, and Gases, students investigated the absorbency of different materials. The term **absorb** was used to indicate water being soaked up to the point where you can no longer see the water drops. Build on this working definition, adding terms such as **saturation** and **water-holding capacity**.

Sandy soils drain well because water can pass easily between the particles. Sandy soil does not hold water well and can dry out.

Clay soils have small particles and can prevent water from passing through them. Clay soil can become waterlogged.

SUGGESTIONS FOR ASSESSMENT

Science Journal Entry: Water-Holding Capacity

Have students answer the following questions:

Your neighbours travel a great deal in their work. Their plants go a long time without being watered. They are going to add new soil to their plants. What soil would you recommend they use? Why?

Look for references to their findings in **Observing the Amount of Water Soils Absorb.**

PRESCRIBED LEARNING OUTCOMES
Students will...
3-4-06 Describe the effect of water on different soils. *Examples: texture, cohesion, ability to hold shape...* GLO: D3, D5
3-0-4e. Respond respectfully to the ideas and actions of others, and recognize their ideas and contributions. (ELA 1.1.2, 5.2.2) GLO: C5, C7 **3-0-4g**. Verbalize questions, ideas, and intentions during classroom-learning experiences. GLO: C6 **3-0-5e**. Record observations in a variety of ways. *Examples: point-form notes, sentences, simple diagrams, charts...* (ELA 3.2.1, 3.3.2, 4.1.3; Math SP-II.2.1, SP-V.2.3) GLO: C2, C6

SUGGESTIONS FOR INSTRUCTION

➢ **Investigation: Observing the Effect of Water on Soils**

Provide students with several different soil samples. Each sample should be labelled. Have students work in pairs to add equal amounts of water to each sample until the soils are saturated. Have students observe, using their senses, and record their observations on the chart given below. Students then form each soil sample into similar shapes such as balls, flower pots, snakes or coils. Leave the finished samples undisturbed to dry and harden for a couple of days. When samples are dry have students observe using their senses and chart their findings.

How Water Affects Soil

Type of Soil

Saturated	Looks Like	Feels Like	Smells Like
1.	_____	_____	_____
2.	_____	_____	_____
3.	_____	_____	_____

Dried Out	Looks Like	Feels Like	Smells Like
1.	_____	_____	_____
2.	_____	_____	_____
3.	_____	_____	_____

Review the data and discuss the results with the class. Pose the following questions to focus the discussions:

- What effects did water have on the soil?
- Did you find that some soils were more cohesive than others? Why?
- Does the wet object feel different from the dry object? Why?
- Who would find it important to know how water affects different soils? (link to 3-4-08)

TEACHER NOTES

A soil's **plasticity**, or capacity to stick together, is an indication of the amount and type of clay it contains. Manitoba's soil, often called Manitoba "gumbo," contains a large amount of clay.

SUGGESTIONS FOR ASSESSMENT

PRESCRIBED LEARNING OUTCOMES

Students will...

3-4-07 Conduct experiments to determine how different soils affect the growth of plants.

Examples: compare the same type of plant grown in sand versus potting soil...

GLO: A1, A2, C2, D2

3-0-1a. Ask questions that lead to investigations of living things, objects, and events in the local environment. (ELA 1.2.4) GLO: A1, C2, C5

3-0-3a. Brainstorm, with the class, one or more methods of finding the answer to a given question and reach consensus on which method to implement. GLO: C2, C7

3-0-3b. Identify, with the class, variables that have an impact on an investigation. GLO: A1, A2, C2, C7

3-0-3c. Create, with the class, a plan to answer a given question. (ELA 3.1.4) GLO: C2, C7

3-0-4a. Carry out a plan, and describe the steps followed. (Math SP-V.2.3) GLO: C2

3-0-5a. Make observations that are relevant to a specific question. GLO: A1, A2, C2

3-0-5d. Estimate and measure the passage of time using standard units. Include: seconds, minutes, hours. (Math SS-VI.1.3) GLO: C2, C3, C5

3-0-7a. Draw a simple conclusion based on their observations. GLO: A1, A2, C2

3-0-7b. Explain why conclusions related to classroom experiments should be based on multiple trials or classroom data rather than on an individual result. GLO: A1, A2, C2

3-0-8a. Recognize that valid experiments normally have reproducible results, which may vary slightly. GLO: A1, A2, C2

SUGGESTIONS FOR INSTRUCTION

➢ How Soil Affects Plant Growth

Ask students, "Are some soils better for growing indoor plants than others? Why or why not?" As a class, have students plan an investigation to answer the question. Have them identify variables that need to be controlled, including the following:

- amount of soil
- type of seed
- location
- amount of water
- type of container

As a class, identify the variables to be used for judging which plant grows the best (height, general appearance, number of leaves).

Have students soak bean seeds overnight, then plant them in a clear plastic cup that is labelled to indicate its soil type (sand, clay, loam, vermicompost, potting soil, schoolyard "dirt," etc.). Attach another cup over the top with tape to create a mini-greenhouse. Have students observe their plant on a daily basis, over a two- to three-week period, and record their observations in a plant diary.

At the end of the observation period, use the following questions to focus discussion:

- Which soil produced the healthiest-looking plant?
- Why do you think this soil worked best?
- Would this soil produce the same results with a different kind of plant? Why or why not?
- What was the hardest variable to control?
- Why is it important to have more than one test planting for each type of soil?
- What might you do differently next time?

➢ Observing the Environment

Take students for a walk around the schoolyard and have them predict how the soils in different areas may be affecting the plants found there.

TEACHER NOTES

Have students use Blackline Master 2: Scientific Inquiry Recording Sheet: Grades 3 and 4.

While planning this experiment, students need to address the concept of a "fair test." They must begin to recognize the factors or variables that must be kept the same in order to be able to draw reasonable conclusions. For example, if the plants were kept in different locations, it could be something other than soil type that affected their growth. Often students want to test several different things at once. They should be encouraged to focus on one aspect or variable at a time, and try to control all the other variables. This way, any differences observed can be more accurately attributed to the variable being studied (in this case, type of soil).

At the end of this experiment, students are asked to reflect on why more than one test plant for each type of soil was needed. Students should be encouraged to realize that with only one plant upon which to base a conclusion, there are many things that could go wrong. The seed itself might have been faulty, the cup may have been knocked over, etc. Scientists like to have more than one **trial**, or test sample, to identify faulty results.

Learning to modify existing plans is an important component of the design process.

SUGGESTIONS FOR ASSESSMENT

Observation Checklist: How Soil Affects Plant Growth

The student

- ❑ carries out the planned steps for seed planting
- ❑ accurately measures, records, and compares plant growth
- ❑ makes reasonable conclusions
- ❑ recognizes the importance and application of the results of the experiment
- ❑ asks questions for information or clarification when experimenting
- ❑ includes labelled diagrams
- ❑ identifies the variables that have an impact on the investigation
- ❑ recognizes that it is necessary to have more than one trial in an experiment

PRESCRIBED LEARNING OUTCOMES	SUGGESTIONS FOR INSTRUCTION
Students will...	
3-4-08 Explain the importance of understanding the characteristics of different soils. *Examples: enables farmers to determine which crops can be grown in a particular area, enables gardeners to improve plant growth, enables engineers to know what types of foundations to set for structures...* GLO: A5, B1, B5, E2 **3-0-2a**. Access information using a variety of sources. *Examples: children's magazines, local farmers, CD-ROMs, Internet...* (ELA 1.1.2, 3.2.2; Math SP-I.1.2.3; TFS 2.1.1) GLO: C6 **3-0-7e**. Communicate results and conclusions in a variety of ways. *Examples: point-form lists, sentences, simple diagrams, charts, demonstrations...* (ELA 2.3.5, 3.3.2, 4.1.3; Math SP-III.2.3; TFS 2.1.4) GLO: C6	➢ **Who Needs to Know about Soils?** Brainstorm a list of people or businesses that need to understand the characteristics of different soils. Show a video, read a book, or invite a guest speaker in to tell about the importance of understanding different types of soils and their characteristics. ➢ **Interviewing Experts** Have students work with a partner to generate a list of questions to ask an expert (soil scientist, farmer, gardener, or greenhouse owner) about soils and plant growth. Have them interview one expert in person, via the Internet, by telephone, or fax. Help students summarize interview results. Have them draw a poster showing the expert they interviewed with his/her tools and workplace. (Link to 3-4-10 by having the experts talk about what they do with organic wastes.)
3-4-09 Identify animals found in soil and explain their importance to soil quality. *Examples: worms, insects, and mammals help to aerate the soil or increase nutrients...* GLO: B5, D2 **3-0-2a**. Access information using a variety of sources. *Examples: children's magazines, local farmers, CD-ROMs, Internet...* (ELA 1.1.2, 3.2.2; Math SP-I.1.2.3; TFS 2.1.1) GLO: C6 **3-0-2b**. Review information to determine its usefulness to research needs. (ELA 3.2.3, 3.3.3) GLO: C6, C8	➢ **Animal Helpers** Ask the following questions: • What kinds of animals did you find in soil samples? • What kinds of animals might you find in soil? • Are these animals useful to the soil? How? Have students brainstorm a list of animals they have seen in their soil explorations. List other animals that may not have been seen. Have partners or small groups select an animal to research how it helps the soil. Have students present their findings to the class.
3-4-10 Describe ways to return organic matter to the soil. *Examples: composting, spreading manure on fields...* GLO: B1, B5, D2, D5 **3-0-7a**. Draw a simple conclusion based on their observations. GLO: A1, A2, C2 **3-0-7d**. Examine how new experiences, ideas, and information connect to prior knowledge and experiences, and record these connections. (ELA 1.2.1, 2.1.2, 3.3.3) GLO: A2, C6	➢ **Where Does Humus Come From?** Discuss with the students what organic matter is and bring in samples of organic matter in order to help them visualize and understand the term (e.g., fruit peels, leaves, vegetable peels, etc.). Together, list ways that organic materials can be returned to the soil (e.g., spreading manure, leaving grass clippings, shredding leaves in the fall). Have students write a definition of organic materials in their science journals.

TEACHER NOTES

SUGGESTIONS FOR ASSESSMENT

Performance Assessment: Animal Helpers Research Scoring Rubric

Scale	Number of Sources	Includes Pictures or Diagram	Organization	Presentation
4	at least 3	yes	well-organized	good volume, clear information, and clear use of visual aids
3	at least 2	yes	complete and clear	good volume, clear use of visual aids
2	at least 1	perhaps	partially complete or complete but not thorough	good volume, limited information, no visual aids
1	1 only	perhaps	incomplete	good volume, limited information

Organic matter, decaying plant and animal remains, contains matter that was once living.

PRESCRIBED LEARNING OUTCOMES	SUGGESTIONS FOR INSTRUCTION
Students will...	
3-4-11 Use the design process to construct a simple composter that returns organic matter to the soil. *Examples: classroom composter for left-over food, school composter for grass clippings and leaves...* GLO: B1, B5, C3, D2	➢ **Design a Composter** Sample design context: The class has decided that the school is producing too much garbage in the lunchroom. They wish to reduce the amount by composting organic materials. Prior to construction, students will need to research what happens during composting and different styles of composting. Existing plans for composters should be reviewed, but students should be encouraged to modify the plans or create their own. Several models may have to be tried in order to find one that is the appropriate size and configuration. Students also need to consider the cost of materials. Possible evaluation criteria include the following ideas: • made of readily available materials • sanitary • easy to load and unload • large enough to handle the organic wastes of two classes • reasonable cost of materials
3-0-1c. Identify practical problems to solve in the local environment. GLO: C3 **3-0-3d**. Brainstorm, in small groups, possible solutions to a practical problem, and reach consensus on which solution to implement. GLO: C3, C7 **3-0-3e**. Create, in small groups, a written plan to solve a problem or meet a need. Include: identify steps to follow, prepare a simple diagram. (ELA 1.2.3) GLO: C3, C7 **3-0-3f**. Develop, in small groups, limited criteria to evaluate an object or device based on its function and aesthetics. GLO: C3, C7 **3-0-4b**. Construct an object or device to solve a problem or meet a need. GLO: C3 **3-0-4c**. Test an object or device with respect to pre-determined criteria. GLO: C3, C5 **3-0-4d**. Identify and make improvements to an object or device, and explain the rationale for the changes. GLO: C3 **3-0-7c**. Identify new problems that arise. GLO: C3 **3-0-8c**. Recognize that designing a solution to a simple problem may have considerations, such as cost, materials, time, and space. GLO: B2, C3	
3-4-12 Investigate how humans from various cultures use earth materials to make objects. *Examples: clay pots, sod houses, adobe bricks, glass...* GLO: A4, B1, B4	➢ **Picture Dictionary: It Comes from the Soil** Ask students: How do humans use earth (soil) materials? Using a variety of sources, have the students work in small groups to research the use of earth materials in various cultures (e.g., sod houses, eating and cooking utensils, works of art, bricks, dikes, etc.). Make a class picture dictionary entitled “It Comes from the Soil.” Have students draw or cut out a picture of the object with a label that identifies the country or culture of origin. ➢ **Expert Presenter** Invite an artist who uses earth materials in his/her art into the classroom. The artist may be a glass blower, potter, sculptor, etc.
3-0-2a. Access information using a variety of sources. *Examples: children's magazines, local farmers, CD-ROMs, Internet...* (ELA 1.1.2, 3.2.2; Math SP-I.1.2.3; TFS 2.1.1) GLO: C6 **3-0-6c**. Place materials and objects in a sequence or in groups using two or more attributes, and describe the system used. (Math PR-I.1.3) GLO: C2, C3, C5	

TEACHER NOTES	SUGGESTIONS FOR ASSESSMENT
Glass is made of sand that is melted together with limestone and sodium carbonate at 850° C. Clay is made up of fine particles of ground-up rock. The clay is shaped and baked in a kiln to make cups, pottery, bricks, etc. Have students use Blackline Masters 4 and 4: Design Process Recording Sheet: Grades 3 and 4.	**Design Process Checklist: Composter** The student ❑ identifies the problem ❑ brainstorms possible solutions ❑ creates a written plan ❑ develops design criteria ❑ constructs the composter ❑ tests the composter based on the criteria ❑ suggests and makes improvements to the composter ❑ works cooperatively ❑ presents the design to the group/class
Artists often make their own clay and use different types of components depending on the texture, colour, shape, translucency, etc., they want to achieve in their art.	

NOTES