Table of Contents

How to Use This Book

As classroom teachers we are well aware of the myriad tasks that face you on a daily basis in your professional life. Time is your worst enemy. Research, planning, and preparation are all activities which must precede instruction. This book was written in an attempt to assist you in preparing, in a time-efficient way, for quality science instruction. The structure of this book was designed with you in mind. The book is divided into a number of sections. The first section deals with how the book can be used in an inquiry-based environment. Information is also provided on how trade books can be selected for your classroom as well as a number of websites that you and your students can use to find additional information.

Subsequent sections of the book are referred to as modules and provide you with the in-depth information, activities and connections to help you in your classroom. Features of every module include:

- **Science background:** Provides a brief explanation of the science concepts needed for a basic understanding of the science discipline being discussed. A number of diagrams are included to assist in clarification of the ideas presented. More importantly, references to the activities are also provided in context within the section.

- **Annotated bibliography:** This comprehensive list of books includes a brief summary of each title. This bibliography was written to assist you in locating children's literature that can be used with each activity.

- **Activities:** Each activity is presented in a lesson plan format that provides you with information relating to the objectives that the activity addresses, a list of materials needed for the activity, and the procedure to follow in conducting the activity. A section on related children's literature specific to the activity is given and the books listed are described in the annotated bibliography. The final section of each activity consists of connections to other subject areas that may be explored. Inquiry-based student lab pages are provided for most of the activities to assist you in the lessons.

As you use this book it is important to realise that activities can be adapted to meet the needs of your students and your classroom environment. There is no set formula for accomplishing this task. The expert on your students' capabilities and behaviour is you. We cannot make absolute suggestions as to how you will adapt anything in this book to your particular situation with your particular students. Each of the activities can be adapted for students who are very talented simply by letting them do more of the exploring. You may wish to ask more questions at the end of each investigation, or have students use journals to record predictions, prior knowledge, and then what they learnt from the investigation. You may ask them how their results can be applied in the real world around them. These strategies are effective in making the activities more challenging for the students.

Each of the activities can be adapted for students who are not skilled in science investigation simply by giving more direction. Depending on the activity, you may prefer to lead the students through the activity by example, step by step, with the entire class in unison. For some students it may be best to read and review the instructions as a group before beginning the investigation. Perhaps the best procedure for some activities is to have the students complete one task each day over a period of several days. Some of the activities within this book may not be appropriate for your students to complete. In that case, you may want the students to simply watch, and/or take notes, and/or answer questions regarding activities you choose to do as demonstrations.

For the activities that you choose to do as student-centred, hands-on and minds-on science experiences, you have many choices for organising your class. You may consider grouping the students in your classroom; in most activities, groups of two to five can be effective. While large groups require fewer materials and equipment as a class unit, they are sometimes difficult to manage. Large groups may also cut down on the active participation of each student. Groups of three are favoured by the authors, although the research on ideal group size is not definitive. The key is to structure the activities in a way that works for you as the manager of a classroom environment.

The materials, including equipment and supplies, required for each activity are appropriate for a small group or individual. Many of the listed items are inexpensive or easy to locate, but some science equipment must be purchased if not available in your school. For sources of the equipment, you may wish to consider commercial suppliers if you have a budget for purchasing materials. If you only have a small budget for science, you may consider contacting your senior school or local secondary school science department as a source of materials and equipment, such a balances. In most science departments, supplies of the kind required in this book are not rare. For example, hydrochloric acid is usually stored in concentrated forms in large bottles, and making a dilute solution for you does not represent a problem for the science specialist. In fact, being used as a resource by a primary/middle school teacher would be a compliment for most upper secondary science teachers.

Density of Minerals

Purpose:
- Demonstrate an ability to use both the graduated cylinder and the triple beam balance.
- Compare the densities of mineral samples.

Materials Needed:
plastic graduated cylinder (100 mL)
triple beam balance
mineral samples (e.g., sulfur, talc, granite, galena)

Introduction: This is a relatively simple lab that is meant to familiarise students with the operation of two pieces of lab apparatus - the graduated cylinder and the triple beam balance. Students will determine the density of four minerals to discover whether all minerals are of the same density.

Special Instructions:
1. Ensure that all slides are at '0'. If needed, zero the balance by moving the thumb screw under the pan of the balance.
2. Place the first sample on the pan of the balance.
3. Move the '100s' weight from slot to slot until the balance 'trips' when the arm falls to the bottom of its range of movement. Move the weight back one slot.
4. Move the '10s' weight from slot to slot until the balance 'trips' when the arm falls to the bottom of its range of movement. Move the weight back one slot.
5. Move the 'units' weights until you obtain perfect balance of the pointer in the centre of its range of movement.
6. Read and record this reading as the mass of the sample in the appropriate spot in the data sheet.

Procedure: See instructions on student lab sheet.

Answer Key For Questions:
1. The increase in volume is due to the volume of the mineral alone.
2. Answers may vary. The difference represents the volume of the mineral and does not include the mass of any water that clings to the sample.
3. No

Portals for Expansion:

Mathematics • Compare densities of rock materials to densities of common objects by creating a number line for plotting the densities determined in the lab.

Geography • Locate on a map or globe the points of origin of the rock materials being used in this lab.

English • Write a letter to a rock quarry to find out which types of rock are used for building material and which ones are used for decoration.

Name

LAB Geology

Density of Minerals

Procedure:
1. Measure the mass of the sample by weighing it on the balance. Record the mass on the chart below.
2. To find the volume of each sample, fill the graduated cylinder about halfway with water.
3. Measure the water in the cylinder by looking at the side and reading the number at the bottom of the meniscus. Record this number in the column 'Volume Beginning'. *Hint:* The meniscus is the lowest point in the top surface of the water.
4. Tilt the graduated cylinder and gently slide the mineral sample into the water.
5. Read the volume of water in the graduated cylinder. Record this number under 'Volume Ending'.
6. Subtract 'Volume Beginning' from 'Volume Ending' to find out the sample's volume. Record this number in the column 'Volume of the Sample'.
7. Repeat Steps 2–6 for each of the samples provided.
8. To find the density of the mineral, divide its mass by its volume. Record the number under 'Density' on the chart. Complete the chart for each sample.

	Mass	Volume Beginning	Volume Ending	Volume of the Sample	Density
Sample #1					
Sample #2					
Sample #3					
Sample #4					

Questions: *Answer the questions on the back of the paper.*
1. Why is it important to measure the mass of the mineral before placing it into the water?
2. Why do you subtract 'Volume Beginning' from 'Volume Ending' to determine the volume of the sample?
3. Do all minerals have the same density?

A  Colour

The colour observed when looking at a mineral.

Observe the mineral and record its colour on the data sheet.

B  Streak

The colour of the powder of a mineral

1. Rub the mineral on the unglazed porcelain streak plate. The 'streak' is the colour of the powder left behind on the plate.
2. Record the colour of the powder (if any) on the data sheet.
3. Record 'none' for the 'streak' of a mineral sample if no powder can be seen.

C  Lustre

The way light is reflected from a mineral; metallic, glassy or dull

1. Hold the mineral so that light strikes its surface. Observe how light is reflected.
2. If the mineral reflects light as if it were a metal, then record its lustre as 'metallic'.
3. If the mineral reflects light as if it were glass, then record its lustre as 'glassy'.
4. If the mineral does not reflect light well, then record its lustre as 'dull'.