

Chapter 1 - Introduction

1.1 Purpose of this Manual

This manual has been designed and written as a reference resource for students in the B.Sc. Earth and Environmental Sciences Programme to use throughout their studies. It includes guidelines for the development of important skills and concepts for use in each of the three streams of the programme (i.e. geochemistry, geosciences and hydrosciences). Students are encouraged to keep this handbook and use it as a handy reference source.

We hope you find this manual useful in your studies and would appreciate any feedback on how we can improve future versions.

1.2 Program Approach

Many courses in the School of Geography and Earth Sciences (SGES) apply a non-traditional approach to learning that involves students being actively involved in the development of both geoscience and research skills as well as the learning of factual material. Several courses use an inquiry-based approach that allows students to take an active role in directing their learning experience and provides many opportunities for the development of research and communication skills. This type of learning has many advantages over more traditional methods as it is widely recognized to increase student interest and retention of subject materials. Good research and communication skills are considered to be important traits for students seeking employment in government, industry or academic sectors and for those intending to pursue graduate studies.

What is inquiry-based learning?

Inquiry-based learning is a form of active learning in which students formulate questions relevant to a particular topic or area of interest, find resources that can help them answer the questions, analyse the data they collect or find, and communicate the results of their research to others. Inquiry-based learning is considered to be a form of self-directed learning in which students take considerable responsibility for what they learn, how they learn and assessment of their learning progress. There are many similarities between inquiry-based learning and the process of research.

A fundamental stage in inquiry-based learning is the development of students' ability to create appropriate questions to direct research activities – all too often students are provided with information without knowing the question that is being addressed, or even that a

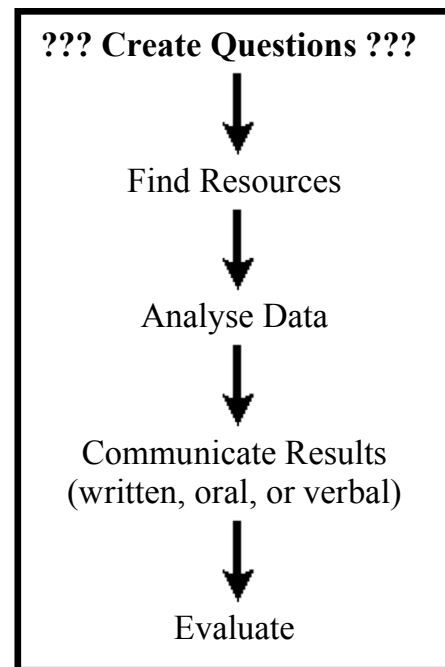


Figure 1.1: The Inquiry Process

question exists. Stimulating students to ask good questions is an important aim for educators today. Some helpful hints on ‘How to create a good inquiry question’ are provided in section 2.4 of this handbook. Figure 1.1 shows a summary of the inquiry process.

Not all inquiry-based learning involves all of the stages outlined above. The inquiry-based approach to learning can be introduced at a fairly simple level by using questions as a basis for lecture material. This allows students to appreciate the types of questions that may be posed – and investigated – in the subject area, and helps them understand the processes involved in attempting to solve or answer the question. Problem-based learning, in which an instructor poses a problem or scenario for students to investigate, can also be viewed as a stage in the development of inquiry skills. Inquiry-based learning also focuses on the development of communication skills and emphasizes the fact that information can be communicated in many different ways including written, oral and visual forms.

1.3 Introduction to Excel

To reflect the now ubiquitous use of computers in most courses, ‘Using Excel’ boxes are included within the text. These boxes provide guidelines and “how to” tips for performing common functions such as graphing and statistical calculations in Microsoft Excel. There may be some differences in Excel or other spreadsheet software from version to version, but the general principles remain the same. When specific function names are used, they should work with most recent versions of Excel. If in doubt, do not be afraid to use the Help commands in your software package. A search through Help sections can teach you a lot about any software and can often save you many hours of frustration trying to figure out how to do something with the software. This guide assumes some basic knowledge of computers, software and terminology. If you are having difficulty following this guide, a basic introduction to computers might help.

Basic Excel Terminology

Title Bar - Shows the program and file that are open.

Menu Bar - Contains pull down menus with all of the available tools and options available in the software package.

Tool Bar - Buttons available represent a number of commonly used features of the software. Fonts can be changed and aligned, symbols added, cells formatted and files printed and saved among the many options. When the mouse cursor is held over a button, after a second it will show a description of what each button does.

Cell - Each unit in the spreadsheet is called a cell (see figure 1.2). Cells contain a value (a number, text or formula) input by the user

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Cell Address - This is the location of the cell in the spreadsheet. For a single cell, it is a letter and number (A1), with the letter representing the column and number representing the row. For a series of cells, the address is given in the form (A1:B6) which would mean that row 1 to row 6 and column A and B are selected.

Selected Cell - The cell with the thick black line around it is the cell which is currently being edited. The text will appear both in the cell and the box to the right of the cell address box.

Series - Sometimes called a data series, this is a group of related cells which are plotted in a chart. Charts may have one or many different data series, each identified by a unique colour or pattern.

Chart - This is the graphical output of the series using the B column of Temperatures as the Y values (series) and the A column of Time of Day as the labels for the X axis.

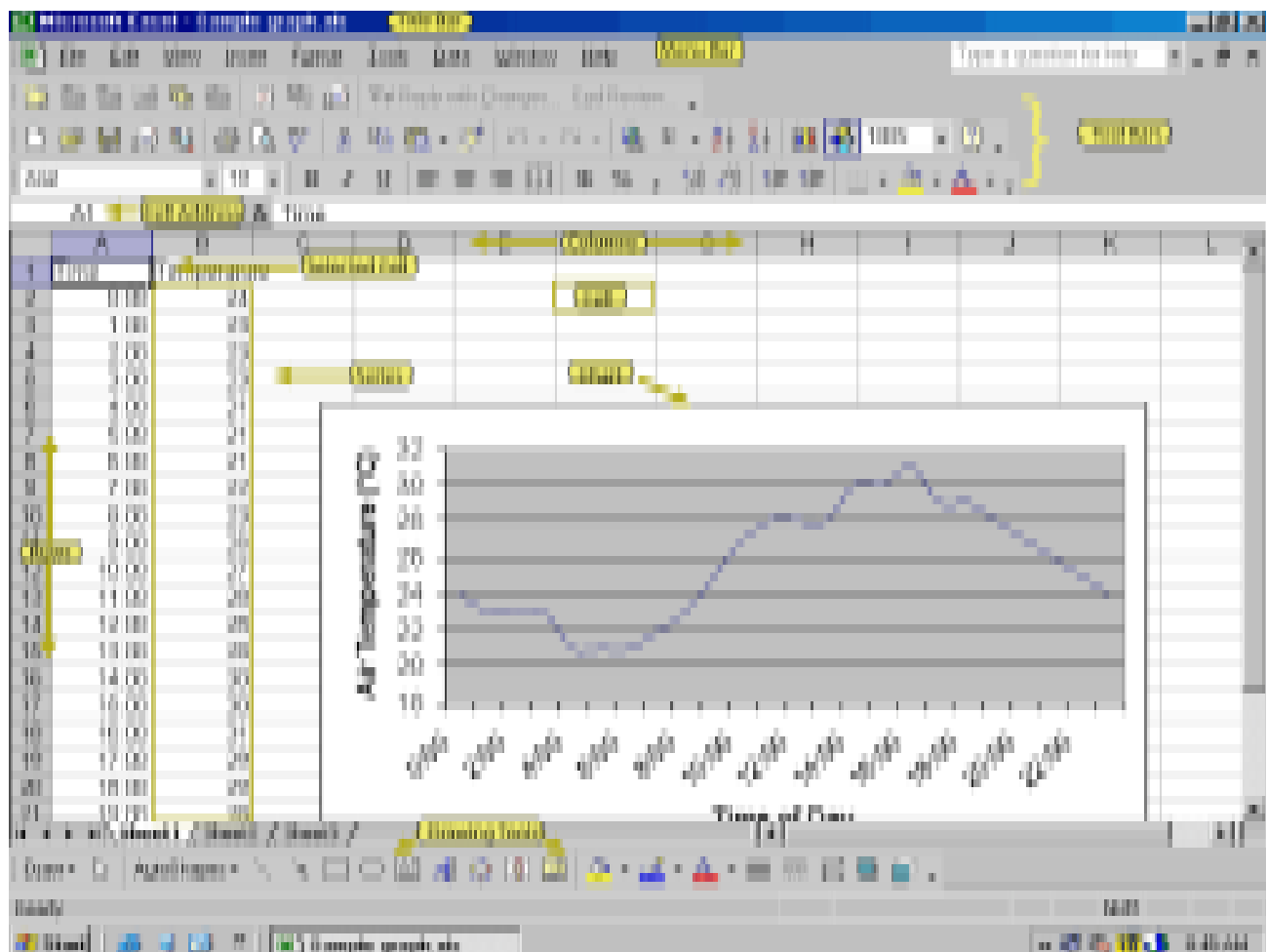


Figure 1.2: Microsoft Excel screen shot with features annotated

Basic Excel Functions

Excel can perform a wide range of functions which will be described in more detail in this text. It is important to understand the basics of entering formulas and copying them to a number of cells.

To enter a formula, the first thing that must be entered into a new blank cell is the “=” equals sign. After this, a formula can be entered using the functions which are summarized below. Excel follows BEDMAS, so it is important to use brackets in the proper places. Excel does not understand square brackets, the only brackets that Excel recognizes are shown below.

Basic Functions

Addition	+	Brackets	()
Subtraction	-	Exponents	^
Multiplication	*		
Division	/		

Sample Formula

$=3+5-(2/3)^6*2$ Excel Output = 7.824417

When the “=” is pressed in a cell, there is also the option to click on other cells, press a function, then by clicking on another cell in the spreadsheet. This can be done numerous times until the desired formula is created.

Copying Cells

Excel can copy formulas down to other cells, properly adjusting the formula to direct the software to the correct cells. This is useful if you are performing a calculation on rows or columns of numbers. It is also useful if you are creating a series of numbers, (ex. 2, 4, 6...100). For this, fill in the first few values, then Copy Down to automatically fill in the values.

To Copy Down, move the mouse over the little black square in the corner of the selected cell(s) and when it becomes a cross, press the left mouse button and drag it until all of the cells required are selected. Excel will automatically fill in the formulas or pattern when you release the button.

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