# Microcomputers and Business Studies

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Pitman

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# Program index


| *Program name* | *Description* | *Chapter* |
|---|---|---|
| HOTEL | Hotel booking simulation | 3 |
| BRKEVEN | Break-even analysis tutorial | 3 |
| VAT | VAT calculation questions | 4 |
| PAYSLIP | Understanding wage payments | 4 |
| TEST1 | Two way test of opposites | 5 |
| TEST2 | True/false English test | 5 |
| TEST3 | Multichoice English test | 5 |
| STAC | Assignment generator | 5 |
| CASH | Cash book assignments | 5 |
| DIARY | Diary or year planner | 6 |
| HANGMAN | Information processing game | 6 |
| SIXGAM | Simple business game | 6 |
| D-SORT1 | Data entry–edit sort–display | 7 |
| D-SORT2 | Data matching | 7 |
| EMAIL | Electronic mail simulation | 7 |


Five Disks for the BBC Microcomputer accompany this book. They should be referred to in conjunction with the text. Appendix 2 (The Fairways Case Study) is based on the use of the first four of these.

HOTEL 0 273 02219 9
DIARY PLANNER 0 273 02218 0
ELECTRONIC MAIL 0 273 02221 0
SIMPLE INFORMATION PROCESSING (D-SORT) 0 273 02220 2
CASH BOOK 0 273 02222 9

In addition the following programs, are available separately
PAYSLIP 0 273 02160 5
SIXGAM 0 273 02088 9
SOLE TRADER ACCOUNTS (STAC) 0 273 02101 X

# Preface

Computers are powerful, versatile tools. Increasing numbers are being supplied for school and college use, yet their support role in the educational environment is underestimated and under-utilised.

This book was written to focus the attention of all teaching staff concerned with the many different aspects of business education, upon the various roles the computer can play in enriching the learning process for students, introducing students to new technology applications at an appropriate level and helping staff to integrate topics within a curriculum. Access to computer processing facilities is not only vital for all business studies students, but the equipment can be used to exercise students' reasoning, manipulative, calculating and retentive powers and provide a motivating influence for the less able.

The fourteen program examples cover a range of ability levels and have been chosen to illustrate the wide range of educational materials which can be integrated with conventional class work, practical work and individual student learning assignments. It is expected that those teachers with little or no experience of computers will be able objectively to assess the potential of this new educational tool and be encouraged to obtain different software to try with students. More experienced teaching staff, who are developing a range of computer related materials, should find many new ideas and recommendations for defining standards which will benefit school and college work in the areas of business education.

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*January 1985* Christine Disney



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# 1 The computer in the learning environment; its implications for business education

Over the last thirty years, many new techniques have been introduced into the education process. The emphasis has been upon increasing student awareness by observation and participation including the development of educational technology aids in the classroom as well as external stimuli such as visits to industry and exhibitions.

In the classroom, teachers balance their subject presentation with the appropriate use of television programmes, films, overhead transparencies, audio tapes, photographic slides, wall charts and recommended reading material. Apart from the stimulation generated by a variety of presentation media, some concepts are more effectively presented by pictures, personal involvement or individual tuition. Bright students will always be able to progress from textbooks and verbal presentation but the majority will be better motivated and relate more positively to well designed, visual, practical and individual instruction.

In this context, during the last ten years, the computer has provided a valuable new resource. Its flexibility and motivating influence have been shown to equal or exceed the types of aids listed above, but its full potential has not been exploited by most teaching staff. Understandably, the majority of computer resources in the past have been used for teaching the subject of computer science and the price of hardware (the equipment) and the availability of software (the educational computer programs or related materials) has precluded the use of the computer as a general purpose educational aid and has limited the amount of individual interaction with this modern tool.

Today, equipment is more readily available, the amount of educational material is growing and it has become more important to ensure that ALL students have an opportunity to use a computer within their curriculum subjects even if they never learn to program. Similarly it is vital that teachers appreciate the various areas where computers can aid the educational process, the levels of staff and student involvement required and the range of typical applications within their discipline. As more software becomes available, the teachers of Office and Business Studies should be able to evaluate and understand its role in the learning process and be confident in using equipment associated with a microcomputer.

Whereas every subject specialist is striving to introduce new techniques to aid the learning process, it is even more important that teachers in Business Education (including clerical, commercial, office studies, administration and

management areas) understand the wide ranging implications of new technology and through its educational use, introduce students to the overall systems concepts of information processing and integrated office automation.

Although a teacher may gain confidence with this new technology by learning to write computer programs, it is *not* essential to the successful use of the tool to enrich learning. However, it is important that the teacher gains experience of using a specific computer program before arranging a demonstration or setting student assignments. Nothing undermines staff credibility more than students entering information into the computer which provides unexpected answers or results that the teacher is unable to explain.

Operation of the different microcomputers varies between equipment supplied by each manufacturer. If the school or college only has one type of equipment the task of familiarisation is easier. If a number of different types of microcomputer are available, one should be chosen and initial efforts concentrated on mastering such tasks as connecting the microcomputer to the power supply and to other peripherals (associated equipment such as keyboards, visual display screens, large monitors, printers, cassette player/recorders, floppy disk units) and using programs held on cassette and/or floppy disk.

Most teachers of Office and Business Studies will find that the choice of microcomputer has already been made but if a choice of equipment is available, it is preferable to choose a computer with disks, at least 32 k of memory accessible to the application program and high resolution graphics in that order of preference.

Access to programs held on disk is much faster and more reliable than via the use of cassettes. A reasonable amount of computer memory is required to support a wide range of teaching applications whereas low memory equipment may be suitable for the teaching of computer programming.

Facilities for high resolution graphics support the use of more accurate graphical representation of information and provide pictures or animated sequences if required. As the amount of software increases, the need for all three of these facilities becomes essential. It is interesting to note that, whereas the old 'typewriter-like' facilities linked to a computer by telephone links had very limited graphical facilities, the most lowly of microcomputers has low resolution graphics enabling easy use of histograms, bar charts, line graphs and picture generation. The high resolution graphics option, often with colour facilities, enables a smaller portion of the screen to be individually identified and manipulated.

Many applications will not require the use of a printer although access to a printer is highly desirable if the equipment is to be used for program development and essential for introducing aspects of word processing.

However, the most important aspect of choosing new equipment should be in avoiding the trap of low cost without due regard to the recommendations of local authority advisers. In particular, where a specific type of computer has become a standard for a local education authority or an education establishment; the long-term advantages of sharing information, programs and expertise amongst colleagues with similar equipment, can outweigh the cost differentials. In all probability, the type will be one of about six

microcomputers which are widely available in schools and colleges and therefore most new published software will be suitable.

Teachers with no previous experience of using computer related materials can benefit from using the programs described in Chapters 3 to 7, although they may require initial assistance from a computing colleague in using the computer with the software disk. The first part of Chapter 2 provides some general information about organising computer materials and scheduling their use with students, the rest of the chapter being devoted to the ideas behind designing and developing programs to support the teaching role and how a subject specialist can help define the requirements ready for a programmer.

Whereas Chapters 3 to 6 discuss the different roles in which the microcomputer might contribute to the general learning process of any topic, the Hotel case study which is used as a recurring theme for assignments and Chapter 7 specifically concentrate on how a microcomputer can be used to introduce aspects of integrated office automation to students.

# 2 Program use, design and development

Newcomers to the use of computer programs in education usually start by personally trying out any suitable subject material and then integrating its use with conventional classroom or practical work. The programs described in this book (which may be purchased on disks for the BBC microcomputer) have been chosen as typical examples of different types of computer materials. The suggested methods of use and assignments included in Chapters 3 to 7 are not exhaustive and are intended only as a guide to potential use. In particular all the programs except VAT (Chapter 4) are flexible enough for a complete range of case studies, assignments and subject material to be built around a specific course and to link with individual teacher preferences and techniques of teaching.

Ideally once confidence and experience have been gained in using computer materials with students, a teacher or group of teachers should look at a course syllabus objectively and decide which aspects can best be served with computer materials rather than other teaching and learning methods. Some difficult topics can benefit from tutorial, remedial and reinforcement programs. Rote learning can be exercised or revised by tests, complex models can be simulated and 'real' information processing applications can be modelled for introduction to student groups. But specifically, in the area of business education, the integrated roles of computer systems (word processing, data processing and telecommunications) can be illustrated by appropriate practical use of small educational models and their interdependence introduced by means of teacher input and linked assignments.

Section 2.2 provides a series of steps by which a computer program specification for new material can be developed; the topics also provide a useful checklist of areas which should be considered when existing computer material is being evaluated for potential subject integration with a specific student group. For those teachers familiar with the BASIC programming language, Section 2.3 considers general aspects concerned with the efficient development of computer software.

## 2.1 The practical use of computer programs with students

These details refer to the typical use of BBC microcomputer equipment in conjunction with software such as the examples in Chapters 3 to 7. However, some aspects eg cassette versus disk use and individual versus shared resources, apply to other types of equipment. All initial decisions about the suitability of different computer materials, however, are unavoidably linked to the availability of equipment.



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If only one microcomputer system (computer, monitor, disk drive(s) and printer) is available, then suitable applications which can be used *effectively* with students are minimal. If the display monitor is large enough, it may be possible to organise demonstration or practical sessions with small groups. Although the computer can be used successfully to display results, graphs and data which would take lengthy manual computation time or be less effective using overhead transparencies, this use as an 'electronic blackboard' is not recommended for large groups unless all students can adequately see the information and the teacher is sure that all the group is capable of following the detail. Thus, in general, a single system is best used for personal staff development until such time as enough equipment is available for student use; or for small, carefully scheduled groups of students who will work together on assignments where all can undertake part of the keying in and interaction sequences, eg business game (Chapter 6) and new technology exercises (Chapter 7). If a classroom is equipped with satisfactory 'electronic blackboard' facilities then most of the programs except VAT (Chapter 4), TESTS (Chapter 5) and HANGMAN (Chapter 6) can be used to illustrate different subject topic details.

Once a quantity of equipment is available, the possibilities expand to meet the ideal situation where each student has access to a computer workstation for a reasonable period of time each week. It is now recognised that substantial benefits can be obtained when students have open access to some facilities outside their timetabled classes and that some equipment should be made available for personal use (for the completion of assignments, revision or remedial work) at different times during the week or weekend. If open access facilities are available then the limited number of supervised practical sessions can be used to introduce the students to a variety of keyboard, operational or application skills concerned with information processing; and individual assignments or recommended software can be set for completion over the succeeding weeks. Whether the workstation is an individual microcomputer system or is linked to shared storage and printer resources, the scheduling of student groups will remain the same although the administration or organisation required to use different types of computer materials will vary depending upon the cassette/disk file storage requirements and whether work will be carried out via timetabled or open access facilities.

### Self-contained programs

First consider the simplest programs which do not use any file handling and are independent of storage facilities once they have been loaded into the computer eg BRKEVEN (Chapter 3), VAT (Chapter 4), TESTS and CASH (Chapter 5) and HANGMAN (Chapter 6). For open access use, the student can be directed to draw the appropriate disk or cassette from the Program Librarian (see Staff responsibilities, p. 7) and upon completion of the exercise or assignment the media is duly returned. For supervised practical classes, self-contained programs should be loaded into the microcomputer prior to the start of a session either by the teacher or Computer Technician (see Staff responsibilities).

In this way equipment that does not have individual storage facilities can be temporarily attached to a disk drive until the program is loaded, or, if

connected to shared resources, the preliminary loading saves delays which will occur when all the students try to load the same (or different) programs from the disk at the same time. Once a session has started, students accessing different programs from shared disk resources at different times will not experience delays in retrieval. Where students have access to individual systems they can all load and process programs independently.

### Programs requiring the use of files

If any programs are concerned only with information retrieval from files ie the program does not permit the stored data to be altered in any way by the students, then the file will be in a 'read only' mode and any number of students can:

*a* access the disk file whilst it is held on shared disk resources (subject to acceptable delays between different file accesses or each student working at a different pace – there will always be conflict if students on a shared system are all instructed to access files at the same time)
*b* use the same disk copies of files on successive sessions

In order to provide teacher flexibility for creating different data files none of the examples in this book use 'read only' files, they are all capable of being changed and will operate in a 'read/write' mode eg HOTEL (Chapter 3), PAYSLIP (Chapter 4), DIARY and SIXGAM (Chapter 6), D-SORT and EMAIL (Chapter 7).

Where students are using individual microcomputer systems, they can be allowed to use any filenames of their choice for creating new files via a word processing or other application program. They can also be instructed to use specific copies of data disks which will contain the files they require for assignments, the contents of which will correspond to particular exercise requirements. If the tasks, with one set of data are scheduled to be carried out over a number of practical sessions, then either the disk must be temporarily allocated to the student who must take responsibility for carefully storing it and remembering to bring it to each class *or* arrangements must be made to label and store the data media for reallocation each session. Depending upon the age and level of students, the first alternative will only rarely succeed.

In the case of shared disk resources, each student must be instructed to create new files with a unique name or confusion will arise as different students enter or amend data within the same file. Usually a combination of initials can be used to both uniquely define a file and link it to the appropriate student. When assignments are to be set for a group of students, then copies of the appropriate data file, each with a different name, will need to be available upon the shared resources. For example if the MAILORD file for electronic mail is being used then copies should be made of the master disk under the names MAIL1, MAIL2, MAIL3, etc and each student should be instructed about which file to access. However, if there is a danger of collusion which needs to be avoided, files with different contents can be generated thereby giving each student a unique filename linked to a unique assignment.

For some assignments, it might be appropriate to check that data changes,

updating etc have been carried out satisfactorily and in this event, it will be necessary to retrieve the data media at the end of a session in order to check the final state of the data files.

Some of the programs such as DIARY and HOTEL are not suitable for use on some shared systems as the data file sizes are so large that not more than one data file may be stored on a 100K disk.

## Staff responsibilities

Although individual teachers will be responsible for evaluating subject area software, deciding student schedules for computer use, developing assignments and assessing student performance in practical sessions or with set exercises; the use of the computer requires a number of administrative decisions to be made either individually or collectively within a department or educational establishment. The size of an administration unit is likely to affect whether new staff are appointed to posts such as Computer Technician or Program Librarian or whether current teaching staff undertake duties in these areas. However, whatever the scale of computer use, administrative procedures will be required and areas of responsibility will need defining in order that the use of the computer resources will proceed with a maximum of benefit to students and a minimum of equipment and media problems for teaching staff.

The term Program Librarian has been used here both to emphasise the similarity in the role of borrowing, using and returning computer materials to that of handling books or written materials and to indicate that it is more effective to make one person responsible for monitoring, maintaining master copies, cataloguing and issuing computer materials held as a central resource than to have every member of staff dealing with miscellaneous enquiries. In situations where large central computer resources with program library facilities are not available, it can be appropriate to install a limited amount of equipment in a library area. These are often open and thence supervised for longer periods of time each day (and possibly weekends) and have competent staff who can be organised to issue computer materials. If a Program Librarian is centrally based, materials are likely to cover a number of subject disciplines and teaching staff will need to provide appropriate copies of programs, data and written user guides with any special instructions for the librarian. Duties should also include circulating appropriate staff members with details of any new materials and keeping a record of all software evaluations which may have been carried out. If these duties are being carried out on a departmental basis then the post might be combined with the following Computer Technician duties.

The term Computer Technician has been used to denote someone responsible for the computer equipment within classroom(s), the adequate supplies of paper, cassettes, disks and other consumables and someone technically competent to provide advice and deal with typical operational problems. Even if another person is responsible for controlling the issue and documentation of computer materials, the technician will need to liaise closely with staff members and be aware of which groups are going to work with the different materials in order to prepare data files, copies from masters for specific assignments and ensure everything is efficiently set up before the session

begins. The organisation and preparatory work for practical sessions is vital if disasters are to be avoided and the best use made of student time with a computer.

## 2.2 Design of computer materials

In order to evaluate the potential of existing computer software or to participate in the design of new programs and computer related materials a teacher will need to assess or define the scope and relevancy for a specific learning situation. The areas requiring consideration can be summarised under the following topic headings:

1 Educational objectives
2 Student prerequisites and level of involvement
3 Preparation prior to using the computer
4 Information held within the computer program
5 Processing sequences and options within the program
6 Special numerical, graphical and file manipulation techniques
7 Documentation

Although the rest of this section looks at these stages as they would be developed for an educational program specification the same analytical approach can be employed when assessing new software for subject suitability performance and ease of use. In this respect, the documentation should be able to provide the information outlined in stages **1** to **6** but it is more likely that the teacher will only obtain the necessary details for a qualitative assessment by using the program(s) and exercising all the available options.

### 1 Educational objectives

The computer program or programs will become an additional resource within a teaching programme and as such must be designed to meet the needs of a particular student group. Although a program may be developed for one particular aspect of a curriculum, it may well meet the needs of other courses. However, it is often better to design a suite of programs of increasing complexity than to try to make one program serve different objectives less adequately. Bright students can be directed to more complex work if appropriate, whereas average students will cope better if they are not confused by advanced features. Another advantage of small units of work is that they can be combined in different ways according to individual staff or student needs and they can usually be timetabled and completed within one demonstration or practical class.

So an initial idea should be defined or constrained to meet specific objectives. These objectives must be used to control the scope of the materials as the specification is developed. New ideas or any expansion of the subject material should be carefully examined and, if necessary, put aside for further development with new programs. This will avoid the common mistake of creating materials which are too large or too complex and which fail to meet their educational objectives.

### 2 Student prerequisites and level of involvement

Both teaching staff and student involvement will vary with the type of program. Although some programs fall neatly into one category of use, the majority can be used in a variety of ways, the limiting factor is usually time or

equipment availability. For example, a simulation program such as HOTEL (Chapter 3) could be used for a demonstration with reception students where the teacher controls the level of complexity through a choice of suitable menu options but it could also be scheduled as part of a more advanced practical assignment. In the latter case, the students require a higher level of knowledge and understanding of the topics before they start experimenting with the computer model. Similarly in information retrieval exercises (Chapter 6) the teacher may explore a topic with a class demonstration or assign individual retrieval exercises.

Although materials can be designed for a range of applications in different learning situations, it is often better to define one role for the materials in the context of available equipment resources and group or individual student involvement.

The main types of programs and implications for use are provided with examples in Chapters 3 to 7. All the programs (except STAC in Chapter 5) can provide individual student interaction and meet the educational objectives of increasing computer familiarity and awareness without involving the students in the detailed complexities of data processing techniques and programming.

## 3 Preparation prior to using the computer

Defining the educational objectives and role of the materials will have prescribed the content and structure of the program (ie subject material topics and interactive testing, simulation or calculation role). Part of this process will have generated ideas of how the student should approach the use of the computer. This next stage defines the nature of this preparatory work.

Unless the program is going to include all relevant background information and theory, either the teacher must introduce the subject material or provide suitable student texts (user guides) to enable the student to use the software effectively. Similarly the student's tasks with the program(s) need to be planned in conjunction with the design of screen interaction sequences and options.

The design of the material can include three levels of student involvement or be directed to one type of use only, but all the relevant support documents should be drafted at the design stage as this will assist the specification process.

For example:

*a* Building a set of default values or a number of pre-set case studies within the program which can be chosen by the student and manipulated via selected parameters.

*b* Allowing any sets of data to be entered and manipulated under the guidance of prepared prompt sheets or assignment exercises.

*c* Assigning investigative or research tasks where information needs to be collected from literature, reports, national statistics or experimental work and then organised for use within a computer package to store, analyse, manipulate or retrieve information.

The tutorial program BRKEVEN in Chapter 3 was designed for use with both inbuilt (default) data which can be used to demonstrate the principles of

constructing different break-even charts, and with individual student assignment data. The business game SIXGAM in Chapter 6 illustrates how students can enter their own decision data and 'play' the game and also how different groups can use the same program to participate in a competitive situation. The D-SORT processing examples in Chapter 7 and various hotel assignments in Appendix 2 include investigative tasks combined with processing.

By specifying the amount of preparatory work and developing worksheets for different types of computer use, the user-software interface becomes established.

**4 Information held within the computer program**

Some programs, especially simulations and information databases, require data within the program which either will remain hidden from student use and manipulation or will be available for display and alteration. It therefore becomes necessary to decide which information will be held internally, which items will be supplied by the user and how this information will be made available and documented. It is in this area that the educational objectives will dictate the balance between computer supplied calculations or answers and user interaction. The power of simulation techniques lies in the computer's ability to manipulate fairly complex models of real systems (whether in the field of economics, accountancy or business) via parameter changes. However, for example, the decision about which parameters should be fixed (for the purposes of defining a simplified model) and which should be variable are still required. By comparison the role of materials designed to exercise a student's calculational ability obviously places the computer's calculating capacity into a checking and correcting role. All these features need considering together with a decision about whether the computer will offer an option to review the information within the program (necessary for the break-even analysis in Chapter 3) or whether a comprehensive user document will provide the necessary details such as the SIXGAM game *Tutor's Guide* (Chapter 6).

**5 Processing sequences and options within the program**

All programs need to be split into a series of user options (often displayed in the form of a menu choice). The main processing sequences will fall into two categories, those which request information from the user and those which supply information to the user.

The processing details will vary for each application; however, it is possible to summarise the types of details which should be supplied for data prompting and checking in the case of data entry and presentation in the case of reports or graphical displays.

**a Data entry**

For each data item, it is necessary to supply a text prompt which will be used to convey information to the user about what text or values should be entered eg 'Variable cost/unit'. The type and range of acceptable responses is then required eg:

| | |
|---|---|
| INTEGER 1–100 | for any number which does not have a fractional or decimal part |



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