THE COST CONSTRAINT IN AUTOMATED
CARTOGRAPHIC EDUCATION AND TRAINING
FOR TECHNICIANS

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ABSTRACT

Much emphasis in training to date has been placed upon
developing the skills of postgraduate research workers
or those of digitising operatives. The College recognises
the need to develop the skills of technicians and higher
technicians in automated cartography. However, high
capital costs and recurrent expenditure to up-date and
replace equipment coupled with substantial operating costs
are likely to limit what can be achieved. The authors hope
to encourage discussion of the industry's requirements and
how these may be achieved.

INTRODUCTION

Luton College of Higher Education has developed a unique
and highly successful course leading now to the Business
and Technician Education Council Higher National Diploma
in Geographical Techniques. Students from the course find
employment in many fields where applications of automated
cartography are increasing rapidly, particularly in petroleum
exploration and development, the public services and planning,
and in field survey. With the exception of the last, the
majority of our students tend to be cartographic illustrators
rather than cartographers in the strict sense. Although
from the outset computing has formed part of the course the
emphasis initially was placed on data processing applications
and has shifted only gradually towards computer assisted
cartography. The course teaching staff believe the time
is now right for a substantial investment in technician
training.

BACKGROUND

The course is a sandwich structure, the students spend the
first and third years in College and the second out gaining
industrial experience. Through a programme of regular visits

to students' employers,from information coming via students
visiting College, through contacts with former students
after completing the course the staff maintain close
liaison with developments in the industry. It was deliberate
policy not to become involved in automated cartography
early in the history of the course but to establish a
reputation for a broadly trained, adaptable student well
grounded in cartographic skills and possessing sound
knowledge of basic survey and data processing techniques.
This has been achieved, but we are becoming increasingly
aware that students completing the course will require
practical experience in automated cartography at a high
level.

The structure of our course as currently approved by the
Business and Technician Education Council (BTEC) enables
us to provide this training developmentally and to differing
levels through the preliminary stage, the core of the course
and options taken at the highest level. Students are
introduced to computer cartography early in the course but
at present do most of their developmental work at the
beginning of the third year on their return to College
from industrial experience. More students are encountering
automated cartographic systems during their work experience
year and our first year curriculum is under almost constant
review.

By abnegating computer cartography in its early development
we tried to avoid committing the College to heavy expenditure
on expensive and rapidly obsolescent equipment whose
capabilities were frequently limited. As the equipment
enters the third generation we feel that expenditure can
now be justified.

THE OBJECTIVES

The requirements for technician training are different from
those for operatives or for research workers but provide
linkages between these groups. The technician requires a
wider range of skills than a machine-minding operative;
a higher technician requires managerial skills to organise
work and ability to solve problems which may arise both
from the machine and in its products. The higher technician
may require the ability to carry out all tasks performed
on the job and to switch between jobs, changing for example
from one contract to another whilst supervising a shift.

Our objective of a Diplomate who can successfully switch tasks
may well involve a high level of understanding of computer
operation and the use of user-friendly and less friendly

systems and possibly machine languages as well as more
common languages. We do not consider a knowledge of
programming essential when the student completes his or
her course. Programming is a specialised task beyond the
course and carried out in employment to meet specific
requirements. It is knowledge of the applications and
limitations of programmes we regard as important.

We hope to provide worthwhile experience of an inter-
active computer system or systems, using both the student's
own data as well as other data. To be able to produce
maps using existing frameworks and to design within the
limitations of existing programmes. There is a need to
be aware of the different types and outputs and the different
methods of plotting. Most of this will go on in the third
year because we remain committed to a firm understanding
of the basic graphic cartographic principles taught in
the first year.

ATTAINING THE OBJECTIVES

The teaching staff have submitted to the College a number
of options costing between £5,000 and £300,000. The lowest
price is for a simple system to demonstrate the principles
to students. The highest price is for the ideal of 10
interactive workstations capable of working on a single
problem simultaneously through a central 'teaching console'
yet also being capable of independent work for student and
other projects. This is our primary objective, how can we
attain it?

In terms of cost,£300,000 is a greater investment for a
single course than the College has ever made. Our estimated
running and replacement costs equal our present Departmental
income covering 35 staff in Science.

Obviously it will require special funding, we believe that
this can be obtained from the Department of Education and
Science; the Natural Environment Research Council; Industry,
as well as local sources. In return we would expect to
share the facility with other Colleges and with Industry.
We already share other facilities with a Polytechnic and
are extending this agreement. We have expressions of
interest from local cartographic firms to use equipment if
we get it. However, in education buying capital equipment
is treated like purchasing a house - how many of you would
buy your auto-carto equipment with a mortgage over twenty
years? Would any manufacturer or factory lease us equipment
on an annual payment we could afford? Used equipment is
superficially attractive but spares and maintenance costs
become prohibitive.

THE TRAINING PROCESS

Having obtained equipment and found how to use it we need
to apply it. Our validating body, the Business and
Technician Education Council (BTEC) will need convincing
that CAC or Auto Carto is more than button pushing and
screen or printer watching and requires high level skills.
Our present course is in four stages, three of which
would require modification for Auto Carto. In the
Preliminary Stage - the first term in College - there
would be an introduction to computer graphics as part of
a general computer course. We cannot yet rely on all
students entering with a sound knowledge of computers and
computing. This should provide the basic motor skills
of keyboard, loading and running and some understanding
of capability of CAC.

In Stage One - the rest of the first year, students would
work as groups on assignments and exercises set by staff
but in-putting some of their own data and observations.
This would be regarded as Level III by our validators.

Stage Two is the industrial experience year where exposure
to CAC is likely to remain variable for years to come.
Hardly any of our 25 or so employers have no computer
assistance be it only a self-rectifying KROY machine or a
typesetter; only the largest can afford full-scale inter-
active automation.

At Stage Three - the third year of the course emphasis
would shift towards student directed project work - examining
applications and developing them further, exploring designs
and styles of mapping and graphing, making innovations. To
provide time for this other things in the course may have
to have less time. To begin some of this work may be
done by small option groups but given the rate of expansion
of the applications we could not hope for it to remain so
for long.

CUSTOMER NEEDS

We serve two groups of customers. You,whom we serve directly
by training technicians and secondly your customers whom we
serve indirectly. You are interested in the quality of
training we give our students we know that they are accepted
throughout the cartographic industry and want to keep it
that way. It is these technicians and higher technicians
who will produce the products that keep your customers happy.
We know that they may not necessarily be using 'hard copy'
maps in the future but whatever they have it will require
good design and sensible production. This is a very
important development in cartographic illustration and we
intend to go with it.