

The development of a design and technology active research culture at Edge Hill

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Abstract

A school based or similar research project forms a major component of the design and technology undergraduate teacher training course at Edge Hill. The research is central to the dissertation module; the structure of which has recently been changed to reflect its importance in enhancing the trainees' understanding of educational issues. The new module consists of two parts. Firstly, an introduction into research practice including experimental design, devising a methodology and data analysis. The second is a research project where trainees make use of the range of skills learnt. Trainees are encouraged to use a wide range of data collection methods including cases studies, taped interviews, observational research, questionnaire methods and structured interviews. A comparative approach is now being used for many of the studies. This allows one or more sets of data to be objectively compared so that common trends can be identified. This is useful in the case of international comparative research whereby best practices in design and technology can be assessed. This paper will briefly describe the research structure at Edge Hill and discuss the rationale of the approach. It discusses the importance of active and comparative research in terms of their relevance to the expansion of the research base. Three short examples of research projects are included to illustrate the some areas being carried out. The paper discusses how the programme has developed a positive research culture amongst trainees who are now encouraged to use active school based research in their future careers.

Introduction

The aim of this paper is to discuss why and how the design and technology undergraduate research programme at Edge Hill is an important factor in enhancing the trainees' critical understanding of wider educational issues. Hopefully this will promote a 'research culture' in which trainees carry out further school-based studies as part of their future careers. The discussion begins with why the research programme is an important part of the course; how the programme is structured; and in what ways the trainees will benefit in the future. Obviously in a short paper it will be difficult to do justice to the vast amounts of data gathering and analysis which has been carried out by the trainees. However, some examples will be given to illustrate some of the work that has been carried out to date. The work has provided a valuable resource for the department especially in terms of adding new dimensions to educational debates. It also

provides a foundation for further work in a wide number of educational areas.

Firstly, then, it will be useful to outline some of the merits of the research activities especially in terms of the developing the trainees' critical abilities. In this respect it is not always the specific content of the research which is important but many of the skills and techniques which have been developed through the process of carrying out the activity. These include the abilities to sustain their work rate and motivation over the research period, developing arguments which are built upon supportive evidence, using a range of sources to gather information and organizing and structuring an in-depth piece of work. Many of the students on the two year BSc (Hons) route have not been in full time education for a number of years because they have been working in industry or other business sectors. The research activity is therefore an important vehicle for introducing many of the 'higher order' study skills which will hopefully be beneficial in the future. This widening of their outlook in terms of assimilating information and developing their critical argument abilities should help them make contributions to the various ongoing debates that occur in the modern educational world.

Many of the techniques and processes that have been experienced through the activity of carrying out the research can also be transferred to the understanding of the problems and frustrations that pupils may experience when working through their design and technology coursework projects. In particular; what have they learnt by breaking down the work into manageable stages? How did they overcome seemingly difficult problems? What techniques can be used to motivate pupils to keep up their pace of progress throughout the year?

Another outcome is that the experience goes a long way in developing groups of high caliber design and technology graduates who can effectively compete with other disciplines in the areas of critical education discussion and debate. This is important because in the UK there is often the assumption that anything that relates to engineering, technology or manufacturing is somehow inferior in academic terms to some other disciplines, an opinion that can translate to the school situation.

Finally, the results of a well executed research project can make a contribution to the body of design and technology knowledge, especially in how it relates to the wider educational perspective. Again compared with some other subject areas the body of research as a whole may be limited. It is hoped, therefore, that the

experiences carried during the course will enable trainees to continue with research projects in the future, either by conducting small school-based research projects or making a contribution to broader studies which can be published in publications such as the *Journal of Design and Technology Education*.

The research programme at Edge Hill

The research programme forms part of the final year of the course. Other modules in this year of the course include industrial modeling and simulation, product analysis, a design project, product design and teaching related studies. A 12-week, second block, placement forms a significant part of the year.

The rationale for the module, which is termed research in design and technology, is that it allows the trainees to pursue an independent research activity which can explore issues based around the design and technology curriculum. The work can build upon and extend some of the knowledge gained in other areas of study. In particular, the programme seeks to:

- develop the skills and capacity to carry out research at an undergraduate level
- pursue an area of research which is relevant to the trainee
- build on and reflect on issues that have been developed by the research programme
- develop skills that are necessary to carry out and 'write up' an independent research study.

Although these aims can be recognized as standard for a large majority of students carrying out an undergraduate research project as part of a dissertation module - the module at Edge Hill has been organized to allow many of the research skills to be developed within a structured framework. This has not only enhanced the quality of the research being carried out but is also the result of the need to complete much of the work within a shorter time than that of non-QTS students. On non-QTS courses, for example, most students have the whole of their final year to pursue their research. Typically they will identify topic areas, refine hypotheses, gather information and survey the literature between September and Christmas. They may, then, analyse their data between January and February and then start 'writing-up' their work between February and the Easter period. The QTS trainees do not have such luxuries. The majority of their work has to be completed in the period between September and Christmas and also within a short time around the Easter period. This is because teaching practice is also included in the final year.

The module is, therefore, organized in such a way that close control can be kept on each of the trainee's progress. The main emphasis being on structuring their work so that each stage of their project is monitored and discussed both by tutor involvement and through seminar sessions. A recent re-validation of the course has allowed changes to the delivery methods so that the quality and scope of the research can be enhanced. There is now an introduction to research practice which includes experimental design, devising a methodology and data analysis. The second element builds upon this work whereby the trainee carries out school based or a similar research project. Here the trainee can make use of the range of skills and techniques learnt in the introductory sessions. The outline content of the introduction to research practice includes:

- information gathering, literature searching and the use of ICT methods in searching
- introduction to research methodologies
- critically analysing publications
- time management, project planning and its control
- the anatomy of a research paper and dissertation; their structure and organisation
- the use of statistical methods in data analysis. The use of computer packages such as SPSS.
- analysing and communicating research results.

During the programme the trainees attend and contribute to a number of seminars. These are designed to promote discussions on particular research projects so that the researcher can receive feedback. In the first seminar the research outlines and proposed methodologies are discussed. The second seminar focuses on the results and data analysis. During these sessions trainees are able to receive constructive criticism on their progress to date, receive advice on possible future directions and also benefit from shared ideas from the group as a whole. These sessions also give the trainees the opportunity to gain experience in preparing and delivering work in a seminar format.

Towards the end of the year the trainees will present their work at a research day. This is seen as important since it is a chance for the group to share their results with others within the department. This goes a long way in achieving one of the aims of the programme in that it adds to and extends the body of

educational knowledge within some aspects the design and technology curriculum.

Methodologies and research areas

Where possible trainees are encouraged to carry out school or related research projects in an activity related way. This will allow them to collect primary data which can be used to support their work. The aim of their programmes should, therefore, be to extend the knowledge and understanding already known about an area and not just to be a vehicle for summarizing existing ideas; many of which can be found in the existing literature. The range of possible research areas is wide and includes curriculum issues, assessment methodologies and their effectiveness, links with industry, disaffection in schools and special needs and its relationship to design and technology. Emphasis is placed upon collecting and discussing the data in such a way that it can inform future teaching and help enhance the quality of educational delivery.

A critical review of the literature forms an essential part of the programme. Amongst other things it helps identify areas of research which may be useful for study and also helps in the formulation of an hypothesis. An initial literature search is especially useful in identifying similar projects which may have already been carried out. These may, in turn, lead to similar methodologies being used so comparisons can be made between both of the studies.

A number of data collection methods may be used including the use of questionnaires, case studies and structured or semi-structured interviews where trainees are encouraged to use tape recordings to gather information.

Activity based research and comparative studies are becoming increasingly useful in gathering informative school related information. The comparative method is now being used in a number of projects to make researched comparisons between different countries. This form of research is now made more accessible through the use of computer web sites and conferencing facilities where questionnaires and other methods can be 'posted up' on the Internet.

The remainder of this paper will discuss the use of the comparative approach and activity based learning. It will then, briefly, give three examples of studies which have been carried out to illustrate some of the research areas.

A comparative research approach

Comparative research programmes are especially useful where the merits and demerits of one or more system can be judged against each other. On a small scale basis, for example, it may be useful to analyse how effective

different teaching methods are between two parallel classes. The differences in learning achievements and understanding can then be compared so that differences between the methods can be assessed. One group can, therefore, be regarded as a 'control' group allowing the outcomes from the second group to be systematically compared against that datum.

As previously discussed, the comparative approach is now being used to examine and compare teaching styles and related practices between the UK and other countries. Such programs are structured to identify elements of good practice which may be used to enhance teaching methods and increase the competence of trainees.

The merits of the approach are:

- the comparison of two or more groups or systems in this way can be seen as being more analytical and systematic than merely analyzing the observations of one group in isolation
- it draws attention to the underlying structures that may be common to different groups
- comparisons can bring out specific characteristics of a particular group
- comparisons can be used in the search for variance or differences between groups.

The comparative work being carried out is especially useful in benchmarking existing educational methods so that elements of good practice can be fed back into teaching methods.

Merits of activity based research

Teachers have a wide range of reasons why it is difficult to devote time to research activities. In some cases small scale research has developed into part of their teaching role which can include a study of specific aspects of their teaching and requires time to communicate their findings more widely. The demands of teaching therefore means that teachers need to see the value of engaging in research if they are to invest time in such studies. For example, positive sharing of ideas, the importance of refraining ideas and analyzing different ways in which to deal with different situations.

Basing research on school based activities can therefore provide data which can be seen to have a useful purpose by those carrying out the research. For the wider educational community, a consistent output of teacher research can increase respect for practitioner knowledge, the way it is developed, and the particular contribution that teachers can make to the body of knowledge.

Brief overview of some projects***Does design and technology have positive effect on disaffected pupils?***

This study examined the possibility that the design and technology environment may produce a more positive attitude amongst disaffected pupils due to its relevance to the outside world and future employment. In the study, data was collected from taped interviews undertaken with a sample of pupils from secondary schools in the north west of England. The questions during the interviews were designed to draw opinions on the relevance of design and technology to other curriculum areas, employment aspirations and learning experiences in design and technology subjects. Extended responses of the pupils were used to discuss the findings of the interviews and to formulate ideas on how the design and technology subjects were perceived by the pupils.

Findings highlighted how there was a general consensus amongst the pupils that the practical lessons were a source of enjoyment and motivation. When asked to relate the difficulty of design and technology in comparison to other subjects the majority of the interviewees rated the subject as easier than most other subjects'. However when pressed further many had based their opinions on how enjoyable their experience of the subject had been. Equating ease with appreciation of design and technology subjects was also linked with personal proficiency in that subject. For instance one comment was 'it's easier... I like it; it's exciting making things. It's easy making things because I'm good at doing things with wood...' (Year 9 boy, behavioural difficulties)

Although the research evidence suggested that many pupils felt that the design and technology curriculum was an area in which many pupils felt that they could competently partake there was also the opinion that the subject was less important than other subjects. This can be summarized by one comment, 'It's not important ... because everyone ... like the teachers and my mum say that if you want to get a good job you have to get good GCSEs, like English and maths (Year 10 girl).

A comparative study of design and technology teaching between the UK and Australia

This is a useful study to briefly discuss since it illustrates how the Internet can be used to conduct research over a wide international field. The researcher initially constructed a web site on which he could post up the aims and details of the study. A questionnaire was devised and sent to various agencies in

Australia including schools, colleges and some government departments.

Two main areas were of interest to the researcher. Firstly, what are some of the main differences between the way in which design and technology is taught in the UK and in Australia. This will help to highlight elements of good practice that can be used to inform teaching. Secondly, to investigate how effective the Internet is at providing a research tool with which to carry out such research activities. From this investigation recommendations on the pros and cons of the method can be given to other research workers. Results of this research are currently being analysed and will possibly be published in the future.

A study of the 'alternative curriculum' and its relationship to design and technology.

This is an example of another topical area. The alternative curriculum seems to be becoming a common feature of schools in the north west of England. A region which, in employment terms, suffers greatly from post industrial decline.

Four schools in the north west were surveyed, all of which were drawn from a 20 mile radius. Structured interviews were carried out with pupils, staff and other parties. These sought to find out more about the nature of the provision at each school and who were the recipients of each provision.

Pupils participating in alternative curriculum provision were asked to complete questionnaires, which, amongst other things, asked for the pupils' opinions on how they considered the alternative curriculum in terms of their future careers.

There are a number of findings from the work, clearly too many for this paper. However, in terms of support for an alternative curriculum it seems that a great majority of the pupils felt that they learnt more than in other lessons and that they found it vocationally useful.

Conclusion

As can be seen by the discussions, the active research program has made a good contribution to developing a critical awareness of educational issues amongst trainees at Edge Hill. The work carried out tends to be vibrant and exciting as well as being academically rigorous. It is hoped that the work carried out by the trainees can be carried on throughout their future careers so that important design and technology issues can be discussed and research work can be used to inform teaching and learning.