Effects of ethnicity in learning preferences in technology

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The research investigates learning preferences in Technology in a sample of the pupil population (N=90) from two schools in the Greater Manchester conurbation. Students' multiple choice responses to a series of nine questions regarding their preferences related to learning in technology were analysed. Within this investigation it is noted that very few significant differences can be shown between the South Asian and European (white) populations. Significant differences were found, however, between the groups regarding preferences for the practicality of Technology work and the teachers' opinions of their creativity in lessons.

Introduction

This research is concerned with ethnic variations in learning preferences in Technology of pupils in Years 8 to 10 in UK secondary schools. It does not consider relative performance of pupils in terms of ethnic differences. Technology is interpreted to include both the Design and Technology and the Information Technology components of the curriculum.

Differences between the educational systems of the UK and South Asian countries are substantial, especially in terms of learning and teaching styles. The basic enquiry of this research is that these differences might influence the preferences of pupils from the various South Asian ethnic communities in UK schools. Almost all of the pupils studied in this research are born in the UK and very few have visited South Asia. Those from the various South Asian ethnic minority communities, however, mainly have one or more parents or grandparents born and educated in a South Asian country. Variations in learning preferences thus might be transmitted through family influences. The nature of these differences has been a matter of much discussion between the two authors of this paper.

In Pakistan, secondary school education includes, for example, a generally higher proportion of memorisation of content, class question and answer work, abstract reasoning, etc, but at the expense of learning other process skills and practical work. Practical work in Technology tends to focus on limited resistant material and graphics work for boys and home economics activity for girls. There is relatively little coeducation. There are some isolated examples of good work in electronics, etc delivered though science activities, but it is possible for many children to pass through secondary education with little exposure to technological thinking in any of its interpretations.

Culture and Technology

The first UK National Curriculum in Technology included reference to work with ethnic minority pupils, particularly through its Non-Statutory Guidance in Design and Technology capability (NCC 1990). This was not especially sensitive to the needs of ethnic minorities, but did put the need to include non-British sources in the teaching of Design and Technology to the forefront of thinking in the new methods of presentation of Technology. It also encouraged the use of non-British sources as a means of enhancing thinking about the nature of Technology. This was right, and in the interests of all pupils. There are very real opportunities to use cultural issues in Technology through discussion of values (Price 1993).

Pupils' activities in Technology will be about the use of particular processes to achieve particular ends. The identified end may be seen in terms of the need for a created item, an artefact - or the need might be in the form of a problem to be solved - or again design might be undertaken purely for interest and in the absence of a problem to be solved or need to be met. Whichever of these is the understanding of what is being done, each will have explicit or implicit criteria for the process being

undertaken. Criteria are dependent on values; values are derived from cultural understandings. The outcomes of technology, as well as the way in which the process is undertaken, are thus a function of culture, and of sub-cultures. This adds a very much broader view to the understanding of 'appropriate technology'. The area has been well discussed (eg Budgett-Meakin 1992, Layton 1992).

This research now seeks to add to that understanding by a pilot investigation into cultural influences in Technology classes in which the pupils' preferences in styles of learning might be used to advantage in their progress.

It is emphasised that a negative finding is equally of value as a positive finding. If differences do not exist, that in itself is important.

Research Design

To study the different learning preferences there are two main types of technique available (Price and Whipp, 1996). The first of these might be the use of openly expressed learning preferences. This would use free-response questions directed to selected pupils, and recorded and analysed using an established qualitative method. This has the great advantage of not making presuppositions regarding the differences to be observed, and it provides a thoroughness of analysis that would be sensitive to some of the subtleties of ethnic variations which prior informal study might lead us to expect. However, it is less easy to use such a method to make a study of a large number of pupils without considerable disruption of their learning environment and likely cross-discussions between pupils during the making of measures. The risk of contamination of data is thus quite high. It is also very time-consuming. On these grounds the technique was rejected for this study, though it might usefully be used in confirmatory research to verify the findings.

The second main type of technique is the use of an inventory, using a simple structured set of questions applied simultaneously to all pupils. This has the advantages of avoiding discussion amongst pupils between making the measures, significantly shorter data collection and processing time and minimal disruption of the lessons in which the testing takes place. The questions used might normally be multiple choice or free response (one word or short answer). Multiple choice questions have the advantage of rigour in the subsequent analysis though the free one-word answers have much to commend them in eliciting responses prior to their categorisation, rather than the other way round for multiple choice. The technique, however, lacks some of the power of qualitative methods.

The decision was thus made after some discussion to use a multiple choice method, with five alternatives in each question. These correspond to rank ordering of a variable being investigated, but not on an equal interval scale. For some of the variables, the design of a monotonic scale is difficult and the responses were checked in this regard by discussion with a number of practising school teachers of Design and Technology. However, in some cases we cannot be sure that they are truly rank-ordered for all children responding. It might be that preferences will be expressed because of the influence of hidden variables subsumed within a given response and not related to the position of that response in the list of alternatives offered. A conscious attempt has been made to neutralise the effect in each question of variables considered in other questions, insofar as this is possible. This is difficult and the risks of false responses and interrelation effects are high.

A moderately large sample (N=90) was used. It was necessary that data processing and analysis was by non-parametric statistics.

Technological Preferences

Nine preference variables were investigated. It is not suggested that these are independent, nor that they are unique. The choice and construction of these presented great difficulty and there is some level of compromise in the decision of what is selected. Clearly, other variables might equally fairly have been selected. The choice was mainly based on our observations of the differences between teaching styles in UK and Asian schools in the authors' experiences. Additionally a pseudo-random variable was introduced.

The variables are as follows.

1 *Practicality*: This variable is designed to look at the level of practicality within technology. It was the most difficult question

to construct in terms of monotonicity. It relates to the different levels and types of practical activity between UK and many South Asian systems.

2 *Memorisation*: Memorisation counts greatly in some Asian educational systems, and considerable credit is given to pupils able to memorise and recall important information in their studies. Examinations also have a very high memorisation element. It is therefore hypothesised that there might be a remanent element of preference for memorisation within the UK Asian community. We might also question whether the memorisation of Qu'ranic text within the Muslim community also has an influence. This research is not able to distinguish between such potential sources of influence.

3 *Creativity*: We have no reason to assume that there will be any difference between the preferences for creative activity as against non-creative activity in the two communities studied. Creativity is, however, a very important dimension in Technology and its inclusion was considered important. If there are differences of cultural preference in this respect then knowledge of those differences is important for the teacher. However, there are different aspects to creativity and this crude test is unlikely to differentiate between these. Design of this question is thus difficult and its crudity might lead to loss of validity in the measures.

4 *Technology Traditional Gender Bias*: Children brought up within the UK culture are now becoming used to seeing the different aspects of Technology in neutral terms with regard to 'masculinity' and 'femininity' of activity. Parental influences towards reinforcement of traditional gender bias would appear to be declining quite rapidly since the introduction of the National Curiculum. A null hypothesis that there are no gender preference differences between the two different ethnic populations was included. We are conscious that the very strong traditional gender stereotyping in much of South Asia might be transmitted to pupils through family structures and through visits by and to family members in South Asia.

5 *Out-of-school Technology Hobbies*: There is no reason to suppose that out-of-school activities differ in technological content between the two populations. However, if there is a difference, and if this difference does not correspond to the preferences expressed for in-school activities, it merits further research. The variable was discussed at some length with teachers and others, and the limitations of such a simple set of alternatives is recognised.

6 *Technology Reading*: This looks at preferences in reading between the two groups and ranges from non-technological through to highly technological literature. The responses might be influenced by particular reading done in school - for example the provision of particularly interesting non-technological literature in a recent English Literature lesson might be influential in selection of an option of, say, adventure stories.

7 *Vocational Interest*: The list to determine career preferences has sought to present alternatives requiring probable similar educational levels, and of equal social prestige in the communities considered. This is an almost impossible task because of inter-community variations. Year 11 pupils were omitted from the research because many have made binding career decisions. (There was also the practical issue of not interrupting their examination work at a critical time.)

8 *Social Preferences*: This question tests for pupil preferences in the social aspects of working conditions in Technology practical work. Superficially, the rank ordering looks correct, but there are secondary effects which complicate this issue. The question is used in its simplest form.

9 *Pseudo-Random Number:* This is for checking purposes only.

10 *High-low Technology*: To regard South Asian countries as developing countries is a major oversimplification. To make further assumptions concerning the South Asian ethnic minority communities in the UK in this respect is illogical. Occupations and ambitions amongst the children in the

ethnic minority communities would appear to be very complex. This question was included for interest, without any preconceptions of what possible findings might be.

Sample and Data Collection Procedures

Two schools were selected in the Greater Manchester conurbation having relatively large recruitment from the South Asian population, and covering Bangladeshi, Indian and Pakistani communities, though not in equal proportion. Provision was also made for including any pupils with Sri Lankan ancestry. The schools are members of the University of Manchester initial teacher education partnership scheme. A total of 50 pupils per school was targeted, and teachers were asked to provide data for each pupil regarding achievement in specified aspects of technology; quality and precision of craft work, creativity in design work, competence in graphics work, competence in general computer usage and competence in written work. This teacher enquiry is not to determine relative achievement of pupils, but to ensure that the preferences expressed are in terms of ethnic foundations and not based on ability differences. Also recorded for analysis was the particular ethnic origin of each child (in terms of parental or grandparental nationality) and the sex of each child.

The pupil questionnaires were administered by school mentors in the partnership scheme and teachers were given the usual advice concerning confidentiality, non-influence of responses and timing (which was notionally unrestricted).

Results and Discussion

The raw data were analysed in frequency terms by inspection of each distribution. The relationships between the responses in each question were then studied using Spearman rank order correlation coefficients. The relationships between the rank-ordered variables for South Asian and European (white) categories were then studied using a (two-tailed) Mann-Whitney U-test for each question.

The basic data show that all nine student learning preference questions worked well with responses to all items. Most of the responses were fairly evenly distributed with a few exceptions where one or two responses were unpopular but these were, on the whole, not surprising. A surprisingly low response was noted in Question 7 for the 'Scientist' occupation; this seems unusual when set against quite even responses for the other occupations.

Correlation studies were carried out of the teachers' judgements of children's competence in quality and precision of craft work, creativity in design work and competences in graphics work, general computer usage and written work in Technology. These showed very high Spearman correlation coefficients between all pairings of these variables (with range of 0.55 to 0.82), all statistically significant at the 0.001 level. We cannot clarify from this research whether these abilities are in reality so closely correlated, or whether teachers' judgements in any one area are substantially influenced by a general ability in the subject or some other factor. If the latter is so it might be very important for this subject independently of any ethnicity effects. The highest of these correlations was between teachers' judgements of creativity and graphics competence; this is not a surprising finding. Comparisons between inventoried preferences and teachers' judgements therefore require to be treated with great caution, and they are generally omitted from the remaining findings reported here.

The one result, however, to be reported in this context is that of the significant relationship between ethnicity and teachers' judgements of creativity . There was a positive relationship (suggesting that the teachers perceive a higher creativity amongst the South Asian children), indicated both through the correlation (sig.=0.019) and the Mann-Whitney U-tests (P=0.038). However, the statistic used here is not sufficiently definitive for us to make detailed assertions about the finding. It does, however, point to a need for further research. However, no such evidence was received in terms of the children's learning preferences.

Importantly, the Mann-Whitney U test on the 'creativity preference' question (variable 3) showed no significance (P=0.18) in this respect.

Significant correlation coefficients between various pairs of pupils' responses to the nine questions were noted. This indicated that in further research a factor analysis, based on a larger number of types of question than are seen here, might be helpful in identifying suitable groupings of learning preferences. The significant (0.028) negative coefficient between total responses to questions 2 and 8 is in itself interesting in this respect and indicates the connection for the children between style of learning and social preferences. The (unintended) link in question 2 to social aspects of learning might be the cause of the correlation.

There is an interesting absence of evidence of relationships between the responses to the children's preference questions and ethnic background. The exception is in question 1, practicality, where the South Asian ethnic group shows a bias towards the 'computers' end of the options with the European group slightly biassed towards the 'using tools' end. They Mann-Whitney test gives P=0.049. The responses to this question showed the replies concentrating on the first, third and fifth items of the question.

Replies to other questions indicate an absence of relationships in most cases. There is, importantly, no evidence supporting the alternative hypothesis of a connection between the memorisation habits of pupils and their ethnic origins, with P=0.640 on the Mann-Whitney U-test. Similarly, and also very interesting, there is no difference shown regarding career interest differences between the groups (P=0.823). The relationship, if any, between ethnic origin and traditional gender bias is not proven (P=0.111) though this might be worthy of more thorough investigation.

Some issues for further research

The absence of major positive findings in this research could be due to a number of factors, the first and obvious being the absence of such relationships to be found. Alternatively, it might be worthwhile to carry out further research using this sample, extended if necessary to gain suitable working numbers, with separation of the South Asian sub-groups according to nationality or religion. It might also be useful to carry out an analysis of such differences of learning preferences between countries - say using UK and Pakistani children. Similarly, the high correlations between answers to some of the questions asked of the children indicates that a factor analysis (using a larger number of questions) might give us a better understanding of the factors which determine children's learning preferences.

The sample used here was necessarily small and comprised only two schools. These schools were selected for their high proportions of ethnic minority children. Would any findings here hold true for ethnic minority children in schools where their representation was much lower? Such research would require a very large sample unless a paired analysis were to be carried out.

References

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Questionnaire

Please write your name here

Higher Education Link Research
Islamia University, Bahawalpur with the University of Manchester

Please answer all the following questions. If you are not sure, please make the nearest guess you can. Tick just one answer for each.

1 In your Technology Lessons, which of these do you enjoy most? Tick just one.

Using tools to make things in a workshop or home economics room	[ ]
Making things in cardboard and paper	[ ]
Freehand drawing and sketching	[ ]
Drawing using drawing instruments	[ ]
Using computers	[ ]

2 Which of these do you like doing best? Tick just one.

Remembering ideas you have learned in Technology lessons	[ ]
Writing answers to questions set by the teacher	[ ]
Talking with friends about ideas in your Technology lessons	[ ]
Copying notes and diagrams from books	[ ]
Finding what happens when you try out new practical ideas	[ ]

3 Which of these do you enjoy most? Tick just one.

Inventing new things to make	[ ]
Drawing designs of things that you are going to make	[ ]
Writing about things that you are going to make	[ ]
Making things from your teacher's plans or recipes	[ ]
Using kits or prepared materials to assemble things	[ ]

4 If you have a choice, which of these do like best? Tick just one.

Making electronic things	[ ]
Making things in wood, metal and plastics	[ ]
Making drawings	[ ]
Making things in textiles	[ ]
Making things in food	[ ]

5 Which is your favourite type of hobby amongst these. Tick just one.

Practically making things you have planned yourself	[ ]
Building things from kits	[ ]
Collecting things (such as stamps or badges)	[ ]
Reading	[ ]
Watching television series	[ ]

/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\ Please do not write here /\/\/\/\/\/\/\/\/\/\/\/\/\/\/\

6 Which kind of books or magazines do you like best? Tick just one.

Adventure stories	[ ]
Stories about real people	[ ]
Science books or science fiction	[ ]
Books about computers	[ ]
Books about how to make things	[ ]

7 When you have finished your education which of these jobs would you prefer to do? Tick just one.

Engineer	[ ]
Architect	[ ]
Scientist	[ ]
Manager	[ ]
Journalist	[ ]

8 When you are doing practical work in Technology lessons which of these do you prefer? Tick just one

Working on your own	[ ]
Working with someone the teacher has told you to work with	[ ]
Working with a friend	[ ]
Working with a small group of friends	[ ]
Working with the teacher and the whole class on the same job	[ ]

9 What date of the month is your birthday?

Between 1 and 6	[ ]
Between 7 and 12	[ ]
Between 13 and 18	[ ]
Between 19 and 24	[ ]
Between 25 and 31	[ ]

10 Which of the following would you like to know more about? Tick just one.

Aircraft	[ ]
Computers	[ ]
Photography	[ ]
Furniture design	[ ]
Gardening	[ ]

Thank you for answering the questions. Your answers will be a great help to us. Your teacher will collect this paper from you.

Please do a final check that you have answered all the questions. If you have done more than one tick for a question please cross out the wrong one.