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Perceptions of technological competencies in elementary technology education

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Abstract
Perceptions of technology are often confused with attitudes towards technology. While these are closely related, they need to be distinguished to promote a common understanding and a degree of consensus. This paper discusses two investigations into perceptions of technology and attitudes toward technology.

In the first study, conducted in Scotland, groups of people were surveyed for their perceptions of technology with a view to finding a common agenda for debate on the educational potential of technology and its attendant implications for learning and teaching. The results are discussed for individual groups, comparisons are made between groups, and a direct comparison is made between two groups of children of similar age but with different technological experiences. Only tentative conclusions are made since further research for this study, through questionnaires and interviews, will be carried out over the next two years.

In the second study, conducted in the United States, seventh grade students completed a survey on their perceptions of and attitudes toward technology. Detailed analysis is presented of their responses to items dealing with technology, computers, and videos. This study, also, is continuing, so the results of the case study are considered to be tentative.

1. Perceptions of Technology
In terms of research, there is little evidence available on people’s perceptions of technology or technological capability. Layton (1993) suggested that we need to ‘know the terrain’. The research into perceptions was undertaken to learn “where people are” in their understanding of technology. Such evidence may provide a starting point for developing technological capability and ‘making the paths’ suggested by the UNESCO symposium (1989).

Method
In this exploratory study, individual respondents were asked to provide written responses to the open-ended question, ‘What do you think technology is?’ The following groups provided information for this preliminary study:

1. Academic staff from a teacher training establishment in Scotland
2. Secondary school mathematics teachers from United Kingdom
3. Primary teachers from a variety of schools in the Highland region of Scotland
4. Student teachers at the beginning of a Bachelor of Education course.
5. Primary school pupils aged 11-12 years from two schools.

The groups were not informed in advance that they would be asked to respond to the question, had no time for discussion of the question, and were given no explanation of the purpose of the collection of their perceptions. Responses were collected immediately after they were completed.

Results
Information collected was analysed for: (a) range of responses; (b) frequency of responses; and (c) evidence of consensus within groups. Analysis of the responses resulted in the following item bank:

Technology is: application of science, how things work, work with other people, everyday things, making something useful, manufacturing, things mechanical, ideas, new/
modern/future, developments, about people, innovations, a non-living system, designing, industry, knowledge, values, making, computers, attitudes, meeting needs, challenges, learning, interaction with the environment, advancement, use of resources/equipment, investigating, human endeavour, modern resources, techniques, inventions, change, a subject, electronics, hydraulics, communications, creating problems, a process, artefacts, problem solving, science, information gathering.

Analysis of Information from the Groups
Responses from academic staff in a teacher training institution emphasised problem solving (45%), meeting human needs (42%), and use of resources for making (38%). These respondents also cited application of science (14%) and designing (14%).

Secondary mathematics teachers defined technology as applied science (30%), problem solving (25%), making (25%), and designing (11%) as being part of technology.

Primary teachers identified technology as related to science (52%), making (45%), applied science (17%), making things work (25%), designing (20%), and using a variety of resources (11%).

Bachelor of Education Year 1 students identified technology as new/modern/latest developments (50%), advancement (25%), science related (20%), how machines work (20%), and problem solving (1%).

Primary pupils in a school with an unstructured program in technology reported that technology was about things such as machines and radar (54%), or science related (28%), or said that they didn’t know what it was (16%).

Primary pupils in a school with a structured technology program identified technology as making (68%), designing (25%), using a variety of resources (25%), designing and making (21%), and problem solving (14%).

Discussion
Different groups can be seen to identify technology as either being things and, or as a process. Many of the primary teachers and primary children in the structured technology course identified with the processes of technology, while student teachers and children in an unstructured technology course identified technology with knowledge of things. Almost half of the academic staff identified technology with problem solving, but this attribute did not appear in the primary teachers’ responses and only one teacher education student cited it. Of the two groups of children, one group did not identify with problem solving while 16% of the other group did.

All of the groups thought that technology had something to do with science. In the case of academic staff, mathematics teachers and primary teachers, they specifically identified ‘applied science’. Over a quarter of the children (unstructured course) thought it was science related but it was not an important feature of the responses of the other group of children (structured course).

The student teachers had ‘things’, with particular reference to new or modern, identified with technology. This was a similar outcome to that of the children (unstructured course) who identified technology with things and machines.

A quarter of the student teachers identified technology with advancement, a pattern which was not repeated in any of the other groups.

II. Influences of Computer Experiences
This section includes data from a study of the perceptions and attitudes of seventh-grade students in a Texas school after they had completed an innovative team-taught computer literacy course during the 1993-1994 school year (Nicholson, 1994). A thirty-item instrument was administered to 173 students in May, 1994. This instrument was developed from an earlier instrument used in research with senior high school students (Householder & Bolin, 1993) which, in turn, had been developed from an analysis of the results obtained with other instruments in earlier studies (Bame & Dugger, 1990; Fife-Shaw, Breakwell, Lee, & Spencer, 1987, and Raat & deVries, 1985). Items dealt with
attitudes toward science, mathematics, and technology; computer applications; perceptions of aspects of technology; and the students' future plans. Students rated the items on a scale of 1 to 10. A rating of 1 indicated total disagreement with the statement and a rating of 10 indicated complete agreement with the statement.

Results
Mean ratings of the 30 items varied from 2.87 for the item, “I like to do desktop publishing,” to 8.89 for the item, “I enjoy using a computer.” The mean rating for all items was 6.81, while the median rating was 7.01; therefore the overall ratings tended to be positive. (On the scale of 1 to 10, the midpoint of the scale is 5.5.) Discussion of results in this section is limited to an analysis of responses to selected items relevant to perceptions of technology and attitudes toward aspects of technology.

Computers
I enjoy using a computer.

A total of 106 (61.3%) of the students selected the highest level of agreement on this item; while 32 (18.5%) selected 8 or 9.

Everybody needs to know how to use a computer.

A total of 84 (48.5%) indicated the highest level of agreement with the statement.

I will need to know how to use a computer to get a job.

The highest level of agreement was expressed by 70 (48.5%) respondents.

I would rather learn from a computer than from a teacher.

A total of 123 (71.1%) respondents indicated the highest level of agreement with the statement.

Computers make school more interesting.

A total of 106 (61.3%) of the students selected the highest level of agreement on this item; while 32 (18.5%) selected 8 or 9.
I like to use computers to solve problems.

A total of 74 (42.8%) of the respondents selected the highest level of agreement.

Technology

New technology will make future work easier.

A total of 86 (49.7%) students indicated the highest agreement with this statement.

Technology makes our lives better.

A total of 58 (33.5%) selected the highest level of agreement.

More free time will make life better.

The highest level of agreement was selected by 69 (39.9%) of the students.

I like technology.

A total of 49 students (28.3%) selected 10, the most positive choice.

All jobs use technology.

A total of 37 (21.4%) of the students expressed the highest level of agreement.

Technology is easy for me.

A total of 34 (19.7%) indicated the highest level of agreement.
Boring jobs will be done by robots.

A total of 40 (23.1%) of the students responded with the highest level of agreement.

I can learn about technology without a teacher.

A total of 33 (19%) indicated the highest level of agreement by selecting 10. However, 28 (16.2%) indicated the highest level of disagreement by selecting 1.

I plan to study technology in college.

The distribution of responses to this item was almost evenly divided: 81 (46.8%) selected choices 1 through 5; 91 (52.6%) selected choices 6 through 10. The mean response (4.86) was lower than responses to the items, “I plan to study mathematics in college,” (5.61) and “I plan to study science in college” (4.98).

Technology is my favourite class.

The pattern of responses indicates that technology is popular with many students: 63 (36.4%) selected choices 8 through 10. However, it is also unpopular with others: 43 (24.8%) selected choices 1 through 3. In this study, 55 (31.8%) selected choices 8 through 10 and 55 (31.8%) selected choices 1 through 3 on the item, “science is my favourite class.” In contrast, 78 (45.1%) selected choices 8 through 10 and 78 (45.1%) selected choices 1 through 3 on the item, “I like mathematics.”

I like to read about technology.

A total of 40 respondents (23.1%) indicated strongest disagreement.

Videos

Video games are exciting:

The highest level of agreement was selected by 94 (54.3%) of the students.

Video games are not a waste of time.

A total of 69 (39.9%) of the respondents selected the highest level of agreement.
Video games quicken my reflexes.

The strongest level of agreement was selected by 60 (34.7%) of the students.

I am interested in making videos.

A total of 38 (21.9%) indicated the highest level of agreement.

Summary

This portion of the paper is based on data from a sample of seventh-grade students who had experienced a unique introduction to computer literacy in an entrepreneurial environment. It is, in a sense, a case study, since no data are available from other students for comparison. The research utilised a new instrument to obtain baseline data on this group at the close of the school year. Research is continuing in attempt to validate the instrument and to obtain data for comparative analyses.

References
