INTELLECTUALLY HANDICAPPED CHILDREN:
DEVELOPMENT OF HIEROGLYPHIC SYMBOLS

This paper attempts to explain the role of computers in assisting mute autistic children to develop their own sets of symbols as a means of communicating with us. This work has occurred over the last eighteen years and extends some of that done by Dr Maria Montessori in her work, using unintelligent equipment, with both handicapped and non-handicapped children. It concludes that computer graphics has a major role to play in enabling autistic children to communicate with us and, perhaps, with one another. It also develops an argument for enabling these children to conduct a direct dialogue, through artificially intelligent means, with microcomputers and, through this, with one another. Anything less than this should be deemed a failure.

INTRODUCTION

Unless you have worked with mute autistic children, it is difficult to conceive of the sheer frustration of trying to communicate with them. As well as being mute, many of them have no alphabet, no numerical system and, hence, do not undergo the fundamental communicative development that other children undergo before and at kindergarten. Apart from the myriad of difficulties that have been listed by others elsewhere (see Carr 1979; Colby 1968, 1973; Colby & Smith 1971; Elgar & Wing 1975; Ferrara & Hill 1980; Miller & Miller 1973; Penyan 1984; Ricks & Wing 1975; Sacks 1985), there is another which often occurs through their lack of use of a set of our symbols in communication. Whereas there are cases of autistic children being brilliant in the use of musical symbols, for example, these cases are rare. Beyond this, we have their lack of ability to interpret, correctly, our simplest of body language (see Coldwell 1986). But perhaps this statement is a bit unfair as many of us have difficulty in interpreting one another's body language too. The product of their interpretation is deficient, as is commonly believed, or — and this is the hypothesis that we are trying to test — that they are trying to communicate in a different way on a different plane and we are just unable to accommodate or respond appropriately to their attempts. Often, they seem to be turned-off by our responses.

METHODOLOGY

During our early days in kindergarten, we learn to use symbols from three basic sets (see Coldwell 1985b). These take an alphabetical, a numerical and a graphic form. As autistic children frequently have extreme difficulty in comprehending the meanings of and, hence, difficulty in using symbols of the first two types, the writer has developed techniques to enable them to work using computer graphics to develop their own set of symbols (see Coldwell 1985a). Why computer graphics? Why not just encourage them to draw like any other child? It became apparent that drawing, creating, storing and using symbols of their own was necessary to enable them to pass through the phases that our civilisation went through, over a period of centuries, as we developed our current alphabet and other symbols from an earlier hieroglyphic form. But why not merely give them a set of drawings of birds, trees and houses to use? Ready-made sets can be bought as a library for microcomputers of most types? Their use of our ready-made drawings, I suggest, would be just as deficient as their use of our alphabetical and numerical sets. It is important that they develop the symbols themselves to reinforce their ownership of them. This is, I guess, a form of autistic territoriality. (Some of them seem, in passing, to be particularly arrogant! But, here, we may be misunderstanding them just as they appear to misunderstand us.) Further, whatever process they have for doing this, the results can be stored, can be communicated and can be made available for other autistic children to examine. A system of communication can be identified, captured and utilised through the development of a knowledge base by a computer and, perhaps, used by it in responding to them. Further, our analysis of the traces of how they interact with computer systems may enable us to assess and utilise the difference between this and our own communication systems. We use the plural here because it is all too apparent that people from different cultures and even people from different subcultures think and, indeed, communicate in different ways. Meanwhile, these groups develop different norms. Is it possible that, given the ability to communicate with one another in this way, autistic people could develop their own characteristic systems?

RESULTS

Let us consider, for a moment, what has occurred on a number of occasions in a series of sessions of working at a relatively standard microcomputer with an ordinary computer graphics system. From the early experiments, it was found that autistic children could gain control of use of a mouse or, earlier, a puck to such an extent that their performance, regarding pressing the right button, improved with their exposure to the problem (see Coldwell 1989). From this point, we could suggest to children that they draw a cat, a dog, a house, Mummy or anything with which they were familiar. An early discovery was that the symbols that they drew, although indecipherable to us, were recognised, later, by them. Another discovery was that, although non-autistic children could not recognise a drawing of an autistic child for what it was, another autistic child could often do so! Later, we encouraged the children to use these symbols to assemble more complex drawings. Experimentally, we disassembled some of their drawings by rearranging the
symbols only to find that they reassembled them into similar arrangements. More autistic children could also reassemble other autistic children's drawings as they were previously! These findings were worrisome because they suggested that we were not working with unintelligent children. Nor were we working with children who had the normal inadequacies of non-autistic children. Further, it appeared that there was, to them, a correct and an incorrect arrangement of symbols arranged as a drawing. Ordinary children, who have developed some ability with the use of alphabetical and numerical symbols, can, for example, correct combinations of alphabetical symbols (i.e. misspellings) where they are written incorrectly, but they cannot do so with merely graphical symbols because, to them, there have no recognised relationship between these symbols to guide them. Consider the relationship between the symbols A, B, C and D; they are in a correct agreed order. Consider the relationship between 1, 2, 3 and 4; these are in a correct order, too, because one is added to each to produce the next. Alphabetical and numerical orders are, hence, different and understandable. Now consider the relationship between *, #, @ and %; each has a different meaning (to us) but do they have an order? Neither do +, - or x although we learn them in that order in school. Following this theme through, how would we rank symbols representing a cat, dog, house and mother? Graphically, a non-autistic child might place a mother symbol in the door of a house with a cat and dog at her feet; an autistic child might, however, choose a very different relationship. To our surprise, a similar relationship would be reinforced by another autistic child!

**DISCUSSION**

Using graphical symbols, architects will correct drawings where windows are misdrawn on internal walls, for example, or where other symbols are, similarly, incorrectly placed. But this is because the symbols are given agreed meanings by their subcultural group, as sets, to which they attribute correct and incorrect rules for juxtaposing them. In other words, they are developed into a comprehensible system. Meanwhile, some autistic children can reorganise their own and other autistic children's hieroglyphic symbols seemingly in their correct places. They seem, however, to be completely puzzled by the symbols of non-autistic children. This suggests that, through having access to a facility to place these symbols, as one does with a simple computer-aided drafting system, they are showing the symptoms of developing a rudimentary language whereby their symbols are attributed both correct and, by definition, incorrect meanings and, seemingly, correct and incorrect means of using them. Hence, I made a nonsense of their drawings by rearranging their symbols which some of them had the ability to restore correctly (according to them).

**How would autistic children fare with communicating with an impartial, intelligent, logical mind which does not have our inadequacies? Whither artificial intelligence?**

If our interpretation of this is anywhere near correct, and they are placed at networked microcomputers with intelligent software, they may be able to communicate with one another through such an interpreter. This has yet to be tested but we plan to do some sometime in the near future. Secondly, there is the possibility that we are holding them back in their abnormal, though characteristic, mental development because of our inability to communicate sympathetically with them. We may, too, be inflicting our handicap on them. Worse, they are alone and are, hence, frightened. But how would they fare with communicating with an impartial, intelligent, logical mind which does not have our inadequacies? Whither artificial intelligence?

**AUTISTIC SYMBOLIC DEVELOPMENT**

Let us imagine a hypothetical situation. Let us assume that artificially intelligent software exists, that is graphically capable, which could develop a knowledge base from the probings of autistic children. To explain this, we will need to consider a symbol drawn by an autistic child. An autistic child's 'cat' would not look like some ordinary, run-of-the-mill cat. Indeed, to non-autistic children, it would look like, and has been described on a number of occasions as, 'scribble'. But somewhere in the scribble, one would have to look for symbols that would make the drawing a 'cat', a 'house' or a 'Mummy'. Returning to our poor, much maligned cat, somewhere in the drawing of a 'cat' one would find two A-eats. The meaning of these symbols was established by asking mute autistic children to move the cursor around the screen to identify which symbol meant what. By deleting parts of their drawings of cats, one could delete everything but the two A-eats and they would still be cats. If one A-eat was deleted, the drawing would instantly become a 'house' because it indicated a pitched roof!

**CONCLUSIONS**

What can we conclude about computers used as learning tools as opposed to their use as teaching tools, communication tools or merely as a means of manipulating data? Historically, we have learned much about the behaviour of supposedly normal people from the behaviour of supposedly abnormal people. What are the implications for computer-use in education? What are the implications for computer-aided learning? We are well aware that human teachers can do things that computers cannot do but can we reverse this relationship? Can we see past the dogmatic position that is represented by the barrier of socialisation or normalisation? Psychologists, in particular, become incensed when one refers to the use of computers by autistic children for example. This position is taken, too, by an increasing number of schoolteachers who are pseudo-psychologists. They have a fixation on...
inanimate objects! You are only making matters worse! You are being irresponsible! I wonder. We give deaf people hearing aids upon which they become reliant and through which they are able to function again. As a second phase, as Montessori (1948, 1949) found, shy children who worked with learning equipment communicated through the medium of teaching one another to use the equipment. Do you remember, not so long ago, when parents turned off the television in case their children became too reliant upon it? Now educational programmes are being channelled to children to reinforce their schoolwork!

Consider, for a moment, what may be happening when some autistic children use computer graphics-based systems. Firstly, they seem to develop their own symbols some of which form sets (e.g. cat-dog-kennel-tree). Secondly, they seem to have an ability, while working with a computer, to develop a rudimentary language (i.e. they can relate the symbols to one another in correct and seemingly incorrect ways as a means of communicating). Thirdly, language does not develop in isolation but as part of a culture (see Coldwell 1990). This implies that, given the right conditions (for them), we may, in the future, be able to consider them as a legitimate sub-cultural group with an ability to develop their own, complex communication system. But what prerequisites are needed to accelerate this process? There is, perhaps surprisingly, only one. That is to use technology to solve the problem of communicating with and between autistic people before adhering, dogmatically, to inappropriate professional ideologies.

REFERENCES


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