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Art and Science with a Child's Point of View

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How to teach students what to look for without telling them what to see is the dilemma of teaching. Abercrombie

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1. Introduction

Traditional teaching often puts children into a passive position. The teacher talks, the child listens. Present day television, videos and other electronic devices have aggravated this situation. The machine talks and the child is a captive viewer and listener. There is a second problem in this arrangement. With any given teacher a child is usually subjected to that one teacher's point of view, and even when this teacher shows a film, it will usually be a film that fits in with their particular point of view. This can have positive consequences. If the teacher is a genius, children will learn a genial viewpoint. If the teacher's horizon be extremely narrow, they will usually recognize that there is more to reality than this viewpoint and thus learn in spite of their teacher. That which applies to viewpoints applies equally to ways of solving problems. The teacher presents one method of problem solving. If a child intuitively senses an alternative way they are usually put down. Related to this is a further problem. The way children learn differs enormously. Some like to learn bit by bit, gaining confidence as they go, and only subsequently learn about the bigger picture. Others need to have the framework explained first and having understood this they are then quite happy to learn the details involved, i.e., some are inductive, others are deductive by nature. Unfortunately these are differences that traditional teaching methods are usually unable to take into account. This paper proposes a new solution, starting from the insight that television and electronic media are potentially polyvalent and active by nature and can be used to create a new type of dynamic classroom.

2. Dynamic Classrooms

A new approach has been prepared by Professor Martin Lamb (Toronto), who has essentially extended principles of interactive video into a new educational resource. Thus far his programmes involve art (IPAINT), music (MUSICLAND and MELODY MANIPULATIONS), language and linguistics (ITALK), biology (BUILD A BIRD) and chemistry (CHEMISTRYLAND). The programmes are so designed that children can determine their own paths rather than simply following one narrow route laid down by a teacher. There are also multiple points of entry. In the

case of build a bird, for instance, one can proceed inductively, piecing it together in terms of its type of beak, claw etc. Alternatively one can proceed deductively, namely, assume that the bird already exists and then work backwards in the analytical process. This approach is consonant with recent notions of languages of art (Goodman). In psychological and philosophical terms these programmes are constructivist, i.e., they assume that children construct their realities rather than merely adapting to a single reality. Proponents of this school frequently assume that this requires a completely relativistic approach, whereby all constructs are purely artificial. Professor Lamb's method demonstrates an intriguing alternative. For while the individual parts are schematic and make no attempt at photographic accuracy, each part in build a bird, for instance, corresponds to existing birds. Hence while playing with artistic renderings of parts, a child is also learning about ornithological realities and basic correlations between growth and form to which D'Arcy Wentworth Thompson drew attention in his classic work.

These programmes are valid in themselves and have proved successful in the Province of Ontario's educational system. Their potential effectiveness has been greatly increased with Lamb's invention of a new type of hypermedial integrator (MENULAY). Thus far it has been used to enable children to produce their own films integrating their own drawings, animated as they wish, with music which they have composed themselves. The scope of Menulay extends considerably beyond these simple operations. As its title suggests it permits automatic programming and compiling of menus. Hence any combination of media, text, diagrams, music, video, film or optical disc, previously a challenge for the best of programmers, is now literally child's play. Unlike other hypertext systems which usually lock users into primitive images, menulay allows any combination of simple diagrams and high quality images. The method thus far applied to isolated subjects will be extended into a systematic programmme for reconstructing the visual world at various levels. The principles of build a bird will serve as a model for other realms of biology, such as build an animal and build a fish, and botany including build a plant, build a tree, and build a landscape. Similarly the principles of chemistryland will be applied to physics and mathematics. This is in line with recent ideas about a grammar of form (e.g. Steadman, Kirsch), with the significant difference that Lamb's goal is explicitly educational with a view to children developing visual literacy.

More than play is involved. Chemistryland, for instance, assumes an analytical dimension and a dictionary of elements enabling children to make various permutations. This is already available at three different scales and will be extended to encourage children to discover connections between atomic structure , microscopic size and actual substances in nature. Corresponding dictionaries of forms are required for other subjects. The art programme (IPAINT), for instance will have two dimensional geometrical forms such as triangles, squares and other polygonal shapes, their three dimensional equivalents, basic architectural features such as columns, and vaults as well as a grammar of ornament in the tradition of Owen Jones. This will effectively become a visual equivalent of the Art and Architectural Thesaurus at Williamstown developed under the auspices of the Getty Trust. In like manner build a bird and build a fish will be linked with corresponding dictionaries of actual birds and fish.

There already exist a great number of nature films showing birds in flight, animals in action, fish swimming, as well as trees, plants, and minerals in context. An extension of Menulay will allow a child who has, for instance, just used build a bird to create an eagle a) to view a standard video of an eagle in flight or b) to explore what films have been made about eagles. and look at those which

are of interest. Similarly a child using Chemistryland will be able to view films on crystal structure, mining, and chemical reactions.

This approach can be seen as an extension of the construction principles used in meccano games. As they play children become familiar with basic mechanical principles. In like manner as they play with these programmes children will be exploring connections between phantasy and reality, learning to see reality in terms of different levels, discovering which levels are practical or impractical. For more advanced children the scope of this dictionary of forms will be expanded to include further facts traditionally found in encyclopaedias as well as a repertory of basic techniques and problems. The art programme, for instance, will introduce children to linear perspective, alternative methods such as inverted, parallel, and spherical perspective, proportion, colour mixing, and anatomy. This emphasis on techniques will reveal practical dimensions of problem solving and bring to light the interdependence of practice and theory in the acquisition of knowledge. As children advance they can also explore the historical dimensions of these relationships. This will allow them to explore for themselves the extent to which parallels between personal growth and cultural growth are meaningful without requiring an ideological commitment to theories of phylogeny and ontogeny. It will reveal cumulative dimensions of progress without requiring simplistic unilinear assumptions of later is larger and bigger is better. It will also show interrelationships between descriptive and prescriptive knowledge.

This network of connections between constructive programmes, analytical repertories and documentary films will not replace the teacher's role. Teachers will continue to give lessons which they can supplement with explanations using a central screen. Individual screens at each desk will enable children to pursue lessons on their own (fig. 1). While there will be a set standard to be reached for any given school year, this method will allow some to proceed with more speed and greater depth in keeping with their particular abilities. Because children are challenged to participate more actively in a learning process which takes into account the parable of the talents this will be a dynamic classroom in more senses than one. The programmes in the machines will, of course, only be catalysts for playing with real instruments, painting with real brushes etc. and thus be interactive in this sence also.

3. Interactive Televisions

These dynamic classrooms will mark a first stage in a more comprehensive system of networking. By extending principles of interactive television, the process of exploring actively documentary, analytical and constructive materials can be continued on televisions at home. A simple connection between a television and a terminal will allow children to download parts of programmes of interest into their personal computers. Assignments and projects begun at school can thus be continued as homework. This principle will apply equally to children, students and adults.

4. The Past as a Databank for the Future

As databases become ever more comprehensive and systematic, the historical dimension will become correspondingly more significant. Since each society, in casting light on specific problems, leaves others in darkness, the past offers a cumulative repository of human experience, a record of different expressions, alternative questions and solutions. At prsent only a representative sample of

this enormous heritage is accessible in a handful of great libraries such as London, Munich, Paris, Rome and Washington. In the long term this new approach to education will make this heritage available to everyone in their own homes. The need for travel, to see things in context, to experience different cultures at first hand will never be replaced. No optical disk will ever capture the beauty of the Tivoli gardens in springtime, the magic of a view from a peak in the Dolomites, or a sunset on a Greek temple. Experience will retain a paramount importance. Even so this new approach will vastly enrich a person's context in preparing for these experiences, and the framework with which they reflect upon these adventures after the event. Learning is not just a list of facts or even a set of experiences. It is discovering the unending interconnectedness of this our world, with all the wonder and awe that this entails. That is why it is so important to see art and science from a child's point of view: not only to help children, but also to relearn for ourselves how to see the world with all the freshness and the magic of a child's viewpoint.

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