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There are no translations available.

Matrix Theory – Background Research

Please read the introduction to the first of these papers before reading this one in order to ascertain their relevance to your studies.

We wish to emphasize that this we present this paper for its scientific interest and that while this is extremely valid, the other concepts discussed herein are not in any way endorsed by us. Our solution to the problems encountered in schooling for example lie not with reforming schools but in removing them from the lives of children and the interference with intelligence. It is our conjecture that the failure of two-thirds of adults to ever achieve the ability of formal reasoning is due to a failure of the relevant brain networks to develop, and that trying to teach the wrong things at the wrong ages is in part responsible for destroying this part of intelligence [although it is not the only thing responsible]. Those wishing to explore this further should consult the relevant files on Matrix Theory in this section, including Epstein's first paper about child development.

We highlight in bold the most relevant sections of this paper. The tables of data connected with the research have been removed due to space considerations. Otherwise the paper is unedited. Those wishing to follow up this topic can find the whole paper at www.brainstages.com

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EPSTEIN PAPERS 2 - THE FOURTH R or WHY JOHNNY CAN'T REASON

by Dr. Herman T. Epstein

Introduction

In recent years many articles have appeared expounding one or another explanation for the perception of ineffective schooling of most of our children. In fact, there are surely many sources of the ineffectiveness and they should be brought out together so that single-cause proposals will no longer be acceptable. Then, the discussions of how to improve our schools will become enough more relevant that implementation of the insights will be the chief problem to be faced.

Schools are traditionally places to acquire the three r's: reading, 'riting, and 'rithmetic. But there is a fourth r needing to be acquired that children are not being helped to acquire - the ability to reason: that is, to be able to use the rules of logic in the analysis of propositions. This ability has also been called other names such as critical thinking, rational analysis, etc. We will see what is needed for this ability to develop and why so few students currently acquire this ability that has not been placed prominently before the public.

We begin with a sketch of the history of reasoning studies as most psychologists would describe it today.

Starting in the post-World War I period, Jean Piaget and his associates in Switzerland studied the reasoning of children by interacting with them from the earliest possible age. Beginning with children who were about 2 years old, the investigators raised questions with children and, after replies were made, probed to get their validations. With very young children (around age 2 years), virtually all of children's utterances were repetitions of something that had been heard being said by others, such as parents, siblings, other relatives, and still others in the community. Roughly, the answers were close to what we would call rote answers, dependent mainly on memory of something experienced. Because most of the experiences were in sensory or motor realms, this was called the sensory/motor level.

It wasn't until the children reached about age 5-7 years that a marked difference was observed in the answers and, especially, in their validations. The difference was mainly that there was clear use of what we call logic. The children had then become able to reason about directly experienced situations. The Piagetians called this concrete reasoning. Further study of concrete reasoning revealed that there were at least a dozen elementary reasoning schemes being used. These were found to fall into three categories: classification, sequencing (or seriation), and conservation. Conservation refers, for example. to asking children if there is a change in the amount of milk when it is poured from a tall thin glass into a wider glass.

These categories can be further subdivided. Classification was subdivided into classification by one property, by two properties, etc. For example, objects could be classified by size or color, or shape or hardness, or combinations of these. Similarly, subdivisions were found for the other two categories.

When children reached about age 10 years, an additional difference appeared in that children no longer were bound by directly experienced situations. For example, they could consider broad topics: instead of talking about one child of their acquaintance, they could begin to talk about children -or about fathers or autos. In doing this, these advanced children were abstracting from directly experienced objects or situations to broader groups which could not be directly experienced. For still another example, children could begin to grasp the idea of probability or other contingent aspects of life. This formal or abstract reasoning level was also divided into many more elementary reasoning schemes.

The Piagetians used what they called a clinical interview to determine which reasoning schemes a child had mastered. They posed questions of the children and then asked about how they arrived at their answers. As mentioned above, the elementary reasoning schemes (classification, etc) were what were being used.

Because each clinical interview took two or three hours, it was only possible to get data for a small number of children. Some psychologists decided to try to create a simple pencil and paper version which could then be administered to many children and thereby obtain data about broad classes of children.

What seems to this writer to be the most accurate such test was created by the group at Chelsea College in London, led by Drs. Shayer and Adey. Using their test, they obtained data from a broad spectrum of British children, with 2,000 children at each age from ages 10 to 16

years. Another thousand were tested at around ages 17 and 18 years.

[see original paper for associated table]

It is readily seen that the onset of concrete reasoning appears as early as age 3 years, but its major appearance is around age 6-7 years, as found by the Piagetians. Similarly, the onset of formal reasoning is at 10 years, but there is never a breakout year, and it is never manifested by more than about one-third of the students and adults.

From the point of view of schooling, when children typically enter first grade at about age 6 years, only one third are able to use any logical reasoning. That means that they are not ready for much of what is usually taught at that grade. This issue of readiness is a significant one for schooling and this table gives the first general information about readiness. Some teachers and principals have estimated for me that about one-third of the matters in junior high school require formal reasoning. Yet, at those ages (12-14 years) no more than 20% have reached that reasoning level.

That means that most of the children cannot understand the most significant matters being taught in junior high school. In essence they are being taught in a foreign language. The result is that such children begin to pay no attention and begin, as is now well known, to consider dropping out of school. When they arrive in senior high school and the lack of understanding continues, drop-out behavior becomes a real alternative.

Teachers surely know that there is a spectrum of ability levels of the children in their classes, but they don't know how to handle it. If teachers were really aware of the data in the table, they would know that significant modifications of their instructional level are needed for these non-ready children. That still wouldn't tell them what to do.

What is needed is what can be called cognitive level matching (CLM): matching the level of instruction to the expectations of the individual students. Now that we have the Shayer/Adey

test (and others developed since then), teachers can discover the reasoning levels of their students and interact with them accordingly.

There is no question but that this is an enormous strain on the teachers, and requires that the teachers, too, be tested for their operating cognitive levels. [The need for such testing is evident from the last line of the table which gives the data for adults.] Adults remain at the highest percentage reached at the end of high school: only one-third can reason formally. So, acceptance of applicants to higher education schools should be based on testing of the cognitive levels of prospective teachers in addition to the information gathered from the usual SAT test taken at the end of high school for those preparing to go on to higher education.

An additional, but one of over-riding importance, aspect of the table comes from the data just mentioned. Only one-third of adults can reason formally. That means that two-thirds of the citizens in a democracy cannot understand the more complex issues facing them both in life and in elections. Unless ways can be found to increase the percentage, operation of democracies will depend on the ability to formulate issues in concrete terms so that voters can grasp the issues. We don't yet know if the percentages can be increased - that will take some enormously difficult and important research that should be specially funded in our democracy. Until that is achieved, if possible, the continued existence of democracies is in question.