

Appendix C

Implications of Accumulating Data on Levels of Intellectual Development

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For several years data have been accumulating regarding the fraction of various population groups at various age levels that have made the transition from "concrete operations" to "formal operations" in accordance with the increasingly familiar and empirically documented Piagetian Taxonomy¹. Using various Piagetian tasks (or modifications thereof) involving such aspects as conservation reasoning, control of variables, syllogistic reasoning, recognition of inadequacy of information, arithmetical proportional reasoning, etc., investigators have examined school, college, and adult populations ranging in age from about 13-45 yr²⁻⁸. Although the various investigations are beginning to reveal significant and interesting differences between social and economic groups, the grand averages have been emerging, with very little variation throughout the age and school level spectrum: about one-third have made the transition to formal operations, about one-third can be regarded as in the process of transition, and about one-third use primarily concrete patterns of reasoning.

The accumulating data can undoubtedly be interpreted in a variety of ways depending on the orientation and predilections of the interpreter, but we feel compelled to underline the following possible very grave implication for our society: If it is indeed true that one-third of the school population is formal operational by the age of about 14 while one-third is still concrete and that these proportions do not change substantially from then on in spite of further schooling (including at least some university levels), then we face the implication that our educational system is not contributing significantly to intellectual development (abstract logical reasoning). The one-third who become formal operational may well be *sui generis*, making the transition on their own regardless of the educational system, while the remainder are not being helped to make the progress that should be a major objective of formal education.

This is not to say that the educational system fails to develop certain basic skills such as reading, writing, and reckoning and various compendia of necessary facts and information (albeit there is much argument and criticism of the adequacy with which even these aspects are cultivated); our concern here is over the levels of intellectual development the educational system appears to generate.

If perpetuation and advancement of a democratic society do indeed demand the broadest participation of a thinking-reasoning citizenry, if intelligent participation

does involve abstract reasoning on matters such as, for example, what constitutes enlightened self interest, if more people must be counted on to engage in decision making when confronted with incomplete, "on the one hand ... and on the other hand" evidence shorn of reliance on a "pat" answer from an ultimate "expert" (as cogently argued recently by David⁹), then we must gear our educational system to greater effectiveness in enhancing intellectual development than the incoming data show it to exert.

If our suggested inference is correct, it seems to us that explicit awareness of the problem, and measures to attack it, must begin in the colleges and universities. These institutions educate the teachers for the educational system with which we are concerned. They must provide leadership in converting it from a passive one that merely allows the *sui generis* development of a small fraction to one that actively assists the intellectual development of the far larger proportion of the population we have every reason to believe is fully capable of abstract logical reasoning. We recognize that a number of institutions and scattered clusters of faculty members have initiated attacks on this problem. We emphasize, however, that significant progress can only result from far broader and more explicit awareness and from far more massive and wide spread efforts than have yet been activated in the realm of higher education.

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