

Heterogeneous Subgroups

Within a Classroom

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THE USE OF HETEROGENEOUS subgroups within a class differs radically from either teacher- or student-oriented ability grouping. In the first place, its focus is on the job to be done; second, it attempts to use whatever skills may be found in a class; and, third, it makes no attempt to judge the value of anyone's performance other than in terms of whether it contributes to the task at hand. The idea behind heterogeneous grouping is that learning and inquiry are essentially jobs to be done and that different personalities, interests, and skills can make a meaningful contribution to that task.

In biology, especially, investigation requires a wide variety of skills rarely found in a single individual. The proposal for heterogeneous grouping is that individuals should be allowed to contribute to the task of inquiry whatever they can contribute best; that the job is big enough to be divisible into parts to which every member of a class can make a significant contribution. Although a general factor of intelligence will most likely underlie excellence and achievement in scientific investigation, the contributions of observation, manipulation, and attention to detail are invaluable in the process of inquiry.

Organizing for Inquiry

The organization of subgroups within the classroom to correspond to the variety of skills desired should be a personal and voluntary matter. Each student is the best judge of his own interests and abilities. If the group is organized for an efficient division of labor, the organizing element will be skills that complement each other, rather than friendship or other arbitrary groupings.

The ideal biologist is a keen observer of minute details, whose relations he can express by diagram or art-form; he is an analyst who can sort the relevant from the irrelevant and he can express these relations in easily handled symbolic or mathematical form; he is a manipulator, a mechanic, who can arrange or devise physical conditions for observation or experimentation; and he is also able to communicate his findings in a coherent, consistent, meaningful way to others.

It would be an unusual individual who could perform all

these functions; but it would be rare to be unable to locate an individual in a classroom who did not have some interest or facility in one of these areas. The requirements of the task and the different orientations of individuals in the class define the working subgroup: (i) the artist or pictorial recorder, (ii) the mechanic or physical manipulator, (iii) the analyst or orderer-of-relations, and (iv) the recorder or finding-communicator.

This kind of division of labor in a common task can provide wider opportunities for individual expression of interests and capabilities than is afforded in the usual classroom situation with its verbal values. It should also provide a wider appreciation of what inquiry really is and the different kinds of contributions that are made to it by different kinds of capabilities.

Different Kinds of Understanding

The major problem of inquiry is how individual experience—concrete and personal—can be shared with others. Inquiry in the typical classroom works at a very abstract level, in which symbolic information is communicated to only the individuals who are able to manipulate the symbols successfully. Students who do not understand the symbols are not involved in the sharing of information; and, at the same time, much that is significant at the personal and affective level is lost because our symbols are inadequate to communicate these affects.

Inquiry in the classroom, not unlike that in life, has suffered from the domination of symbols and individuals who are adept at manipulating symbols. Heterogeneous subgrouping formalizes the contributions of the affective and manipulative by formalizing roles of individuals in whom these responses are dominant. Recognition of different ways of experiencing inquiry should enrich the inquiry experience in the classroom and bring to the classroom a broader understanding of reality.

The role of the teacher in this kind of setting becomes that of arbitrator between the claims to reality of opposing kinds of understandings rather than as the proponent of the symbolic kind of meaning. As arbitrator, the teacher's job will be to see that the contributions of all kinds of experience are equally represented in the shared understandings of the classroom and in his own evaluation of student achievement. Accordingly, his freedom is limited



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by his choice of material with which to confront his students. He is no longer the main source of information in the classroom but is increasingly the source of mediation for different kinds of understanding. As a person sensitive to the full range of experiences that biology affords and the differing individual sensitivities to these experiences, he will find room for their expression in the conduct of the class and in his own evaluation of what is a meaningful contribution to inquiry.

Expression of Abilities

Living things, the subject matter of biology, may be investigated in terms of form, function, succession, or relation—categories which correspond to morphology, physiology, heredity, and ecology. We have classified individuals as artistic, mechanical, analytic, or verbal; and there is *some* correspondence between the subject-fields and each individual's dominant way of looking at the world: (i) morphology with the artistic, (ii) physiology with the mechanical, (iii) ecology with the analytic, and (iv) heredity and evolution with the verbal (see table 1).

Accordingly, our subject fields provide areas in which the abilities of each student type may find predominant expression. The job of the teacher is to identify these types, allow freedom of expression for their characteristic modes of perception, and bring their contributions into a meaningful interaction with the perceptions of other individuals. The materials of the course are defined by the science itself; the methods of the course are defined by the four ways described of looking at the world; and the conclusions of the course will be the integration of individual perceptions that have meaning for all members of the class.

In this kind of investigation, each organism will be viewed differently according to the discipline employed. The investigation carried on through any particular discipline will be dominated by the personality-type that can best contribute to the subject area. If this program is consistently carried forward, a form of inquiry will result that is a balanced composite of feeling, skill, knowledge, and interpretation, to which most individuals can make useful contributions, whatever their verbal abilities or achievements. Perhaps these contributions will help restore some balance to academic forms of inquiry and allay the classroom injustice of single-value discrimination for verbal ability.

Individual Expectations

When confronted with the materials of the subject field, each individual proceeds through a series of characteristic responses. Table 2 illustrates the sequence of responses and the characteristic level at which each inquiry type is fixed. The responses represent a sequence of stages through which the individual must pass in his independent role of inquirer. Some individuals, the artistic, can get no further than their feelings of attraction or repugnance which sensitize them to the object through their affects. Others, such as the analytic, can pass through the

Table 1. A model for inquiry education in biology.

Subject field	Individual investigation	Subgroup organization	Class—teacher findings
Morphology	A higher animal	Cells, tissues, organs, systems	Relate structure and function
Physiology	What is going on?	Respiration, synthesis, digestion, circulation, excretion	Relate micro-to macro-processes
Heredity and Evolution	How can we account for stability and change in the history of life?	Chromosomes, mutation, recombination, competition, selection	Relate genetic processes to the environment
Ecology	How does life depend on the physical and biotic environment?	Niche, habitat, food-web, biome	Relate organisms and their environments according to dynamic processes

earlier stages of inquiry without hesitation, but their ability to do so may also signal a loss in terms of affect, manipulation, and symbolism. Our aim in classroom inquiry is to give every stage its due, to bring the artistic to an appreciation of the higher stages of inquiry, and to restore to the analytic a fuller appreciation of the early stages of inquiry.

Subgroup Expectations

Subgroups within the classroom function as forums to which individual students can bring their subjective impressions. Ideally, a subgroup will allow the individual to move from his early emotional impressions of the confronting biotic object to higher levels of meaningfulness. The heterogeneity of the group will allow the group as a whole to appreciate the surfeit of affect or ideas which different individuals attach to different stages of the process of inquiry. The group as a whole will provide a place where feelings and ideas can be fully considered and here, hopefully, through conflict and compromise, goals and objectives will appear that will make the richest use of materials and abilities involved. Through sharing a common purpose, a heterogeneous group will provide its own rea-

Table 2. Characteristic responses toward subject fields for hypothetical inquiry types.

	Artistic	Mechanical	Verbal	Analytic
Morphology	Attraction, repugnance	What's inside?	What's its name?	What does it mean?
Physiology		How does it work?	What's the principle?	Why does it work?
Heredity and Evolution			How do I solve the problem?	What forces are at work?
Ecology				How do they interact?

son for being; and through its diversity, a classroom subgroup will be forced into a rich range of experiences.

It is in the subgroup that the individual will find the role in which he can best contribute to the group effort. In defining this role, he will also, as an equal partner in the project, exert a proportionate influence on the outcome of the group task. The role of the instructor vis-a-vis the subgroup should be neutral with regard to its production but weighted toward securing an equal voice for each member of the group. The tendency for groups, even inquiry groups, to be dominated by single individuals, works against the notion of proportional contribution by each member of the group. For this reason, it is important for the teacher to play a part in setting up, at least, the mechanics of the group's interaction.

Expectations for Class Experience

The task of the subgroup is to bring out freely the most private experiences of the individual. The task of the class is to sort the real and meaningful from that which is not, to find out what can be shared with all members of the class and with all perceptive people. The subgroup works to gather a rich variety of experiences from very different people confronted with the same problem. The class as a

whole works to validate those experiences as being objectively real through the possibility of their being shared.

The classroom operates at a number of different levels of understanding: through the testimony of its members, through the insight of its leaders, and through the community of inquirers. Through the testimony of its members, the class gains the benefit of different ways of experiencing and managing problems. Through the insight of its leaders—hopefully, those who can appreciate the full range of perceptions of others—the class is allowed to share the different experiences of its members. Through the conclusions of the timeless community of inquirers, through books and other resources, the class is confronted with the experiences of good and sensitive minds whose judgments have been valued through generations.

The order of the operation of these classroom experiences is of special importance. The usual procedure in the classroom is to go from books and other resources, which are taken as authorities, through a leader who censors or otherwise makes the subject “understandable,” to the class whose members are to absorb these predigested and watered-down shadows of experience. The use of subgroups working on a common task makes the appeal to authority the last appeal, one that should become unnecessary if the group is effective.

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