The Mini-Bloc: Chance and Challenge for Independent Study

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Abstract. In the Mini-bloc: Chance and Challenge for independent study and research, the writer suggests as an opportunity to provide training in desirable study habits and in critical thinking, a unit plan which allows for a study in depth of some aspect of biology on an individual basis. The investigation of a topic selected by the student himself and pursued at his own rate, aims to lead the individual student to the formulation of concepts and a knowledge of scientific principles based upon his reading and experimentation. Due to personal interest in the topic and an unscheduled plan of procedure, the student arrives at a measure of success comparable to his range of capabilities. The unit bloc provides for an independent study project of reading, doing, and reporting in both written and oral form. The four-week project is a chance and a challenge for every student: the less capable as well as the high-ability performer. The utilization of a block of time set aside for the single project study gives it a resemblance to the BSCS laboratory blocks, lacking, however, a definite format. The procedural plan must be outlined by the student himself; this is his challenge.

The English have a saying, "To teach John arithmetic, it is necessary to know arithmetic; but it is equally necessary to know John."

In the March issue of the Catholic Quote, we find a reprint from a Wisconsin Journal of Education which reads: "Father: 'Eat your dinner!' Child: 'Motivate me.'"

All of us are well aware, at times perhaps uncomfortably so, that we are living in a period of revolutions, not the least of which is the revolution in teaching, specifically the teaching of the sciences.

To effect the greatest impact on our students, teaching methods have progressively changed from group instruction by a single teacher in the self-contained classroom, to departmental instruction; more recently, through team teaching (requiring a greater specialization and preparation on the part of the teacher, but giving more attention to the needs of the students) to modular scheduling, in which the emphasis is shifted still more toward the student; and now to programs of individual pupil instruction.

Perhaps a bit more than some care to admit, there has been a tendency in the past to single out groups for special treatment. Far too many authors of high school textbooks had a selection policy that provided amply for the segment of the school population that had potentialities for high-level performance in science.

Recognition of this overbalance, this catering to the gifted, led to efforts to reduce technical vocabulary to a minimum. This shifted

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the emphasis to the underachievers; so, the "exceptional child," at both extremes was provided for.

A truly democratic educational system recognizes that abilities and interests vary widely, so will do its utmost to provide meaningful learning experiences for all its pupils. This necessitates a varied curriculum supported by instructional materials and methods of varying degrees of difficulty.

**Era of Man**

Our era in history has been designated in contrast to preceding eras as the era of the human race by some; by others as the biological era. Important is the fact that the masses themselves, the masses of this race of *Homo sapiens*, are becoming aware of the need for education to live well. They desire to obtain reliable, confirmed knowledge about all natural and physical phenomena. Biology is continuously changing and radically affecting every member of the human race. It would seem, then, that any realistic contribution we as teachers can make to education must be one that has possibilities of developing the mass potential.

The strictly-academic, authoritarian, subject-centered school is of the past. In the "comprehensive" school, in which the college-bound are tracked, the shop-minded are "manually" controlled; the secretarial segment are skill-taught (one might be tempted to say computerized); and the "tech" students are trained on-the-job for remunerative future jobs; the general student for whom high school is the terminal agency of formal education, who will, nevertheless, be expected to play significant roles in the society of the world into which he will enter upon graduation, has less attention given him than he should have.

Attempts have been made, to be sure, to provide for the unequal abilities of the pupil populace, but in these times of changing from a "literal-minded" empiricism to a complex in which conceptual discovery plays the major role, further changes are necessary: in course content, in methods, materials, and in the structure of the program in science.

We must reach the majority of our students; we must prepare the masses to participate intelligently in the life of a scientific age. To accomplish this objective, educators are pointing the way to the individualized pupil instruction program, adding to the alphabetical rostrum, the IPI.

Program teaching lends itself though an enquiry approach to satisfying individual needs while retaining the major ideas and understandings recognized as essential tenets of learning.

An opportunity given the student to select to a degree his own problems for independent study and research should eliminate the need for undue motivation on the part of the teacher, unlike the child in the introduction.
PERSONALIZED PROJECTS

The phrase "learning by doing" is not idle euphony. In the light of the goals of science education, it may be well for us to re-evaluate the problem of providing meaningful experiences for our students. The student-oriented laboratory, if properly designed, parallels the objectives and goals of science education, and provides a multiplicity of disciplines: discovery and development of concepts; systematic thinking; critical evaluation. No less important are the disciplines associated with one's personal development: self-confidence, creativity, tolerance toward self and others, cooperation, stability. With an eye toward the future it is but a single step toward the formulation of judgments and conclusions characteristic of the mature mind of the adult.

Some years ago, while enrolled at Marquette University, I heard a member of the Madison, Wisconsin, school system give a report on an experimentation with the ungraded classroom in the lower elementary grades. The idea was then (1958) quite new and received public attention. It seemed an ideal method of teaching; taking the student at his own level, and guiding him toward a successful completion of one unit after another.

It was with great interest then that I read this fall of the Iowa City pilot testing program which, the newspaper account read, "differs from traditional programs in that a student works individually, or in a very small group, and progresses at his own rate through a series of laboratory activities. The current course . . . is one in a proposed three-year program."

It will be well for us to follow this pilot program on the junior high level. Similar programs in Illinois, Indiana, Florida, and New Hampshire might also be watched, by way of comparison and for what they have to offer of themselves.

To carry some such plan into the next level of academic pursuit—the senior high school—should be no great problem. Such a plan would afford the majority of students the opportunity to perform independently, at their own rate, within their own realm of interest.

I've thought long and deeply, many, many times that something is amiss in our teaching of the life sciences. This is not surprising because this is precisely what other educators, industrialists, scientists, and many of you said, prior to 1958, when the Biological Science Curriculum Study Committee was organized to attempt a solution. The committee swung into action and through concerted efforts came up with the three versions as we know them today. Others since then have prepared laboratory exercises in the same open-ended format. I question, however, whether this change-over is entirely satisfactory, and whether we are achieving our true goals. Could it be that perhaps we have swung out too far in attempting to plumb the depths
of enzymatic reactions and metabolic processes of the living cells, so that, at the secondary high school level, we have become oblivious of the whole, the entity of that which is our world around us. As someone has put it: Science IS all around us; it does not exist only in the science classroom. Neither is science entirely abstract.

Concerned that we as teachers of biology are not making our students aware of life as life and the living world as it exists, and unwilling to discard entirely all that is traditional in the teaching of biology, I must confess to seeking ways and means to incorporate into the modern approach a certain amount of “the good old days.” I am confident this can be done with success.

THE “MINI-BLOC”

Whether or not the schools of the nation adopt the individual pupil instruction (IPI) policy, in the light of what has been said here, a plan I have used for the past three years on a limited basis seems to have merit. Adopting the language of the day, I have called it a “mini-bloc” of independent study and research. The plan is simple; any and every teacher can use it; any and every student can follow it, since it allows for a minimum of teacher-guidance and practically an unlimited scope of depth for the student.

I call it a “bloc,” yet it differs significantly from the familiar BSCS laboratory block. The greatest similarity between the two is utilization of a “block of time” in which the regular textbook is set aside while the students pursue a specific topic. The “mini-bloc” (for the sake of science, I have renamed it the “unit bloc”) has the advantage, however, of being more adaptable and feasible for the greater majority. Other than the need for wide reading on the subject being investigated, the likeness ends there. Poor reading ability, a major problem in secondary schools of today, ceases to be a major problem by the more than adequate motivation provided by the format of the unit-bloc I propose. How do I proceed? What essentially is the “unit plan”? What do the students gain?

Four-Week Project

As used, the unit-bloc is actually a four-week project. The first three weeks are devoted to reading, doing, and writing; the fourth week allows each student to make an oral presentation of his work.

An approach that so far has never failed is an emphatic, pointed directive written on the blackboard. Beginning with neat print, of ordinary size, I write the letters r.e.a.d. two or three times. As the students watch, I print R.E.A.D. in ever-increasing sizes until there is no more room across the board. By the time the last 8- or 10-inch lettering is completed, every student is alert and wondering. Thus the stage is set for me to stress the importance of preparation before activity. Unfortunately the desire and perhaps the ability to DO
seems always to be more widespread and advanced among us humans than the ability to UNDERSTAND. This disparity must be resolved. The important thing is to understand what we do. So, for emphasis, I begin at the beginning and read aloud what I have written. Obviously it would be incongruous and maybe a bit alarming to match the voice in increasing crescendo to accord with the printed word, so an even greater effect is achieved by lowering the voice to almost inaudible proportions as I underscore the largest letters. The technique works. Every student gets the point: READING IS OF PRIME IMPORTANCE in this new activity.

Reading. The first week is devoted to reading. This provides a wider background for each student than can be obtained by assigned reading from a single or even several texts. All available current magazines are at their disposal; periodicals, journals, and reference texts are recommended. During this week it is expected that students who have not already made a choice for a project will do so. It is, in fact, advisable that selections be made before the reading in depth begins; yet it is a well-known fact that one gathers ideas and changes them as he reads more widely.

Mature scientists themselves do not precipitate into immediate activity, a "first-come, first-do" mentality. Galileo, Einstein, even Aristotle, spent much time "playing around with many thoughts," before they arrived at the conclusions that keep their names before us. Certainly, then, we cannot expect our young people, with little or no experience, to plan immediately a course of action. If we are to adapt our teaching to the needs and abilities of the individual student to learn, we must permit a certain experimental "trial and error" leeway. This is the rationale behind this first week of reading.

In a small discussion group on this subject, it was remarked that to be able to give so free a reign to the class, one would need to know the students. As the English put it, "it is equally necessary to know John." This may be; but on the other hand, it might be the opportunity for the teacher to get to know John. In fact, I anticipate using a similar approach on a smaller scale (a one- or two-week project) early in the year as a diagnostic process to permit me to become acquainted with the students, to observe their tendencies, their weaknesses, and attempt to assess their potentials. There would remain then but to follow the diagnosis with a cure.

As the years go on, I am more and more convinced that students must be led along specific guidelines. This is not to say that we must return to the technical methods of research wherein every exercise is prepared by the teacher, typed out, and handed to the student to perform. What I am saying is that the vast majority of students are not sufficiently advanced to formulate their own hypotheses, anticipate a sequence of procedural steps, nor arrive at conclusions as is the
adult research scientist. Am I then opposed to the development of problem-solving skills by the student himself, opposed to the development of critical thinking? Not at all. This need is greater today than ever before.

To repeat, the first week is spent in reading. As a starter, I do give a number of suggestions for possible project studies. These are no more than titles. To help them get the idea of a project in mind, I also cite some references to which the students have access. Of these, the majority are from the magazine, Senior Science, and back issues of what used to be the Science and Math Weekly (no longer in print). These serve merely as guides. Through the examination of projects performed by others, the student gets a footing so that by the second or third day, more than half the students have selected a project they will carry through, none of which are identical to those they have read, and in many cases, not even remotely related. These students then spend the remainder of the week, their classtime and their class preparation time (there is no other "homework" assigned) ... reading on the subject.

Some require a longer time to decide; a few will need to be guided and directed more closely. These more often will stick closer to something they have read and it is the rare student that does not add of his own thinking. However, if the best the student can do is to repeat what someone else has done, why not? This is no different from following a designed laboratory exercise, whether it be in the traditional manner, in an investigative lab exercise book, or from a laboratory block. I believe it is important for us to remind ourselves of the individual differences of our students, and to admit that all of our schools have students that are not the "cream of the crop." This is precisely why I have titled my talk on the mini-bloc: a "CHANCE and a CHALLENGE for independent study."

Activity

The emphasis on the second week is in activity. The first day could be rather hectic, but after two years of a somewhat disorganized beginning, the idea of having the students on the last reading period, write out a list of the materials and equipment they would need, was followed. Volunteer student help come Friday after school or on Saturday and set out all the requested materials with the individual's slip attached. This year on Monday morning there was no problem, and except for minor directives, the dispensing of liquid chemicals, and such-like, the class was able to begin activity almost at once. Here the individualized instruction is notable; some will need no guidance. These students may, in fact, soon surpass the teacher in their perception of the problem and in the subject itself. (These are a God-send; be grateful, and let them go on their own.)

Now the teacher becomes a paradoxical figure. He is present, yet
is not there; he says nothing, yet is teaching full force; the students work independently of him, yet, if the need arises, he is there to direct and guide, or to explain a technique that had not been encountered in the regular class session. Students working with, say, micro-organisms, may have read extensively on sterile techniques, but I give those concerned a demonstration, then, step aside, and let them go ahead. Continually watching from the corner of one eye, I stay in the background, permitting errors unless they would be disastrous or costly. This is independent work and the student is responsible for making his own decisions, yet each student knows he will receive help if he asks for it, on an individual basis. Problems and challenges are the essence of dynamic life. Both teacher and student are challenged in meeting problems that require answers. As teachers it is our task to guide, to lead the student to ask questions of himself, to determine ways of seeking the answers, and perhaps our greatest challenge is to let him do it. In this way only will the student learn. Depending on the project, the nature of the investigation, the errors to be corrected, or the personal desire for perfection, is the number of times a performance may be repeated. Some will have completed their work by the third day; others need the entire week; still others continue their investigation into the third week, which, however, is the "writing" week.

Report. Experience has taught me that far too many students depend on the night before (in this case, a day or two) to write up a report. Just as "mass education," that is, "cramming before exams," is usually quite ineffective on a permanent basis, so is "mass reporting." To offset this error, I require a minimum of two installments of the report. Since the greatest share of the reading is completed the first week, it is not unreasonable to ask early in the second week for a first draft of the following: the title page, an introduction which includes a background for the particular topic and an explanation of terms and processes that will be used, a statement of aims or objectives, and the bibliography to date. A skeleton outline of the proposed plan of procedure is recommended. As a guide, a dittoed sheet of the general format is given to each student. This I consider a necessary part of good teaching. Initiative is fine, but students can extend their experiences and efforts only if they have had some preliminary suggestion or example given them. They can pull ideas out of thin air no more than can we; therefore, somewhere along the line someone has to give them a foundation. On this first copy, I make corrections and suggestions, returning them the following day.

Early in the third week, I ask to see the rough draft of the body of the report. On this, as before, I make suggestions and corrections if needed, and return to the student for a rewriting. The entire report is then due at the end of the third week. The student has access to
his written report for the 10-15 minute oral presentation, but is encouraged to use an abbreviated outline only. Drawings, charts, and photographs are encouraged.

INDEPENDENT STUDY AND RESEARCH

Most of the student's time is devoted to individual work on his "research" project. It might be well at this time to define research as used here. This is not research as might be expected of graduate students, or even of students at the advanced college level. Nonetheless, the research done is true research in respect to the student's present level of knowledge and understanding, and his ability to develop concepts based on reading and investigating. In other words, for the student, here and now, delving into the unknown, HIS unknown, is "research." I make no pretense that we shall break through significant biological barriers. Certainly we may hope, however, that with this fundamental approach to research methods, some will go on to more sophisticated research, and eventually, into positive scientific research. There are those who question the wisdom of introducing pupils to scientific research activity in the earlier stages of their secondary education. My personal thinking is that at the high school level those who desire a more sophisticated approach take a second-year course.

So, for the independent study, each student is encouraged to select a topic that appeals to him. Seldom will a student choose beneath his level. Most aim higher; this reaching is desirable. Usually it is ultimately rewarding, both to the student whose ego is raised through satisfactory performance, and to the teacher, who witnesses growth. The occasional student will toy with the decision to select beneath his capabilities. It is but a small matter to convince such a one that he is capable of more. Such encouragement makes him an "inch taller" and inspires him to delve into books initially beyond him; but, to his surprise (though not to the seasoned teacher's) he not only reads them, but understands the over-all presentation. His beginnings in research may be extremely simple, but gradually they widen in perception and scope, and even if they do not do so to a significant degree, they have without a doubt enlarged his thinking and perspective.

Given time, given proper motivation, permitted to select his own project; above all, given encouragement, the student gets what he most needs: a chance. He becomes a "doer," an "achiever," not a mere passive observer.

We ask ourselves, "Can creativity be taught? Is not creativity a factor of inheritance?" Certainly there are immense differences between student personalities, but most teachers would agree that creativity is innate in every student to a greater or lesser degree. This gift can be stifled; likewise, it should be possible to bring it out.
What I should like to propose, then, is the unit-bloc: a period of time set aside for independent study; sufficiently challenging for those who shy away from the known laboratory blocks; adaptable to the needs of every student. Each student, then, not only receives a chance suitable for him, but a challenge.

There is no single "best way," but the unit-bloc is an excellent opportunity for the teacher to "cover less and uncover more." One of the great problems facing a teacher is to distinguish between what is essential in the formation of concepts and what is formal or peripheral matter. Perhaps our greatest guide should be the student himself; so, whether mini-bloc, unit bloc, lab block, or whatever, the units of work studied and attempted must be of interest and of value to the individual student.

To meet the demands of today's changing and changed times, one must not only be prepared for his profession, but one must have the integrated personalities of the discoverer and the inventor, the industrialist and the economist, the moralist and the sociologist, incorporated into a single personality. This necessitates the teaching of the "whole" man, developing qualities of integrity, perseverance, etc., as well as skills and techniques. This is essential in the world of reality. It is for this reason that I recommend this method of teaching.

In summary, then, why do I recommend the unit bloc? I recommend the unit bloc because: (1) I find this plan successful; (2) it stimulates the student's desire to perform, to produce something worthwhile; and (3) because the effort is satisfying in its results. Invariably most attain a great measure of success and are pleased to present their findings to the group in the fourth week. There are no failures. Early in the project, the students are given to understand that failures are sometimes the greatest successes. When admitting that "it didn't work," the student gives reasons and possible remedies for a future attempt.

Frequently the selected topics are too broad. This, too, is a learning situation. If a student ignores suggestions to narrow it down and persists in the error, he learns from it: (1) not to do so again; and (2) that there are many avenues of approach. His cultural background has thus been broadened.

If we accept the educator's philosophy that no teaching is done unless there is learning, then in all sincerity, I would have to admit that the unit-bloc is a highly successful method of teaching. That the students learn is a fact. They learn much and well. That the teacher learns is also a fact. In the unit bloc, the learning is a cooperative venture, the teacher joining the students in an exploration of the problem. No one, of course, is fooled into thinking that the teacher does not know the answers to be discovered, but these are answers
to be worked toward rather than delivered. Should the students surpass the teacher, and they well might, this is nothing to concern oneself with in this biological age in which students know so much more than their parents and teachers did at their age . . . what with TV, lectures and seminars geared to the young, NSF institutes, etc., the youth of today do know a lot; in some areas, undoubtedly more than the teachers. Take heart, however; no amount of learning can overshadow experience. We still need teachers; we still need YOU.