

SCIENCE

VOL. LVI DECEMBER 8, 1922 No. 1458

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SCIENCE: A Weekly Journal devoted to the Advancement of Science, publishing the official notices and proceedings of the American Association for the Advancement of Science, edited by J. McKeen Cattell and published every Friday by

THE SCIENCE PRESS

11 Liberty St., Utica, N. Y. Garrison, N. Y.

New York City: Grand Central Terminal

Annual Subscription, \$6.00

Single Copies, 15 Cts.

Entered as second-class matter January 21, 1922, at the Post Office at Utica, N. Y., Under the Act of March 3, 1879.

THE GIFTED STUDENT AND RESEARCH¹

LIKE the evolution and development of society, the development of the individual is rapidly coming under more and more consciously and systematically directed control; witness the gigantic educational machinery which is the product of the last twenty years. It is, perhaps, safe to say that the systematic direction of the development of the individual is inversely proportional to his initiative, natural gifts and creative power. Morons are cared for; delinquent students are sorted and served each according to his individual need; the average student follows a routine. But what about the intellectually gifted student? Ordinarily he is held in leash. Let me enter a plea for the emancipation of the gifted student, giving him a realization of his powers and responsibilities, the freedom to soar unhampered above the levels of mediocrity, and to live at his highest level of achievement, weaving early his bonds of friendship with scholars. Instead of whipping him into line, let us whip him out of line.

One of the great contributions from modern psychology is the discovery of the individual and the projection of his profile, here and there in quantitative terms, bringing to us the realization that in a given specific mental capacity one individual may have two, five, ten, twenty-five or a hundredfold the capacity of another with whom he is tied up in the educational mold. Our curriculum and our campus sanctions are so effectively set that very often these individual differences are successfully covered up or smoothed out so that the gifted individual as such is lost to himself as well as to society.

A few years ago, particularly during the

¹ Read before the Association of American Universities at Baltimore, Maryland, November 9-11, 1922.

war, some of us were interested in finding from the senior class in college those who would give the greatest promise of achievement in research work. The rating blank² I have placed in your hands was used effectively for the locating of a certain per cent. of these. Personally I can testify that the individual interviews with those selected on the basis of these ratings furnished one of the most delightful and profitable opportunities for personnel work in administration. With the charts before the student and the interviewer, it was possible to enter into the life plans of the individual at a crucial stage in his career and cause him to view the situation in a critical attitude with profound interest. This is a procedure which has amply justified itself. But we soon found that the senior year is too late. At the end of the senior year the student has already chosen his career and, sad to say, often unwisely, being guided largely by temporary emoluments, a shortsighted estimate of what is worth while, or the easiest outlet for activity at his then recognized level. Business, the in-

dustries, special interests, and the older professions have plucked from the senior class those who are most promising. Without strong traditions in their favor and without the promise of financial rewards, science and art, with very few exceptions, trusting to luck, get what is left. It has therefore become clear that some selection, to be effective, should be made earlier than in the senior year, first, to give scholarship an opportunity in the competition for talent, and, second, to find the gifted student early enough to give him the advantages of preparation that he may crave and deserve.

For this reason, some of us fall back on the opportunity of using the so-called intelligence tests and various substitutes for these at college entrance. These tests should be as much for the purpose of discovering the gifted student as for the purpose of culling out at the lower end. If I may mention a practice which has gradually found its way into Iowa, I may say that those who rank in the highest 10 per cent. at college entrance are summoned by the Dean of the College of Liberal Arts and told

2ANALYZED RATING OF FITNESS FOR GRADUATE STUDY

Directions: Record your judgment on each capacity by placing a check mark (✓) at the appropriate point in the dotted line. Grade conservatively, bearing in mind that in the long run, for a class, there should be as many marks below average as above. If in serious doubt, put a question mark above the check. Guard rigorously against giving information to, or receiving from, others who are rating independently, but otherwise consult freely with those who know the student well.

At the bottom, cite (1) notable specific evidences of achievements, distinctions, opinions or other data that may throw light on the character of, ability or fitness for some particular field, if you know of any; and (2) mention marked negative traits which might be an obstacle in a learned career.

	Very poor 10%	Poor 20%	Low average 20%	High average 20%	Excellent 20%	Super- ior 10%
1. REASONING POWER: capacity for solving problems, both deductive and inductive.....						
2. ORIGINALITY: creative imagination, brilliancy, planful initiative and fertility of rational ideas.....						
3. MEMORY: extensive, logical, serviceable, and ready command of facts.....						
4. ALERTNESS: quick, incisive and responsive observation, thought and feeling.....						
5. ACCURACY: precise, keen, regular and reliable observation, thought and feeling.....						
6. APPLICATION: power of concentration, sustained attention, persistence, and well-regulated effort.....						
7. COOPERATION: capacity for intellectual companionship, team work and leadership.....						
8. MORAL ATTITUDE: intellectual honesty, wholesome moral standards, ideals and influences.....						
9. HEALTH: nervous stability, physique, vitality, and endurance.....						
10. ZEAL FOR INVESTIGATION: deep interest in and craving for original and creative work.....						

that the institution recognizes individual differences both in regard to quantity and quality; that those having given evidence of unusually high powers will be expected to show unusually high achievement through the college course; that they will be watched with hopeful interest by members of the faculty; that an effort will be made to give them such personal direction and stimulation as they may need; and that eminent leadership is characterized by modesty and service.

At the beginning of the second year, the Dean of the Graduate College summons them. Each one is asked to bring three ratings on the blank you have seen; one by himself, one by a student friend, and one by an instructor. In the light of these analyzed ratings and the achievement of the freshman year, we talk over the situation with them individually in preparation for the selection of their major at the beginning of their junior year. This usually leads to an early introduction to the most inspiring men in the major subjects which they are to elect. The selection of a major is then a distinctive step in the finding process, and the selection of an adviser ceases to be a mere form or a mere tool of administration. This procedure has served also to give members of the faculty, who are interested in research, a fresh interest and a clear point of view in the effort to discover in their classes other persons who show evidence of talent for research; because the gifted students do not necessarily fall in the highest group in mental tests.

But even this approach in the freshman and sophomore years has revealed to us the advantage of beginning still earlier. As was shown by Book in the Indiana survey, dull students are as likely to go to college as bright students. In the interest of scholarship it would be extremely wholesome if those who are interested in college entrance could reach down into the high school and inject into that atmosphere the sentiment that the more gifted a student is in the secondary school work, the more desirable it is that he should go to college. It is only by the cultivation of a personal

sentiment of this kind that we can draw into the college those high school students of superior attainment whose education is now curtailed.

What I have attempted to say so far is that it is in the interest of creative scholarship as well as culture in general that we should frankly recognize the enormous magnitude of differences in the individual capacity for achievement and that this principle should be asserted early in the course; first, that students may be found in the adolescent period of enthusiasm and generous aspiration and wisely protected from the machinery which is set automatically to grind high and low to a common grade; and, second, that instincts of curiosity, criticism, collecting and comradeship which blossom in the early adolescent period may be fostered in an atmosphere of freedom, encouragement and opportunity for achievement.

Having thus entered upon a program of doing what we can to discover the gifted student, what can we do to follow up this discovery in the undergraduate course? This question has been answered by a very elaborate report prepared for the Association of American University Professors by Professor Wilkins pointing out sixty-seven varieties of things that may work to this end. I shall not here attempt even to summarize or classify these as they will undoubtedly appear in a formal report of his committee.

The Division of Educational Relations, with Dr. Vernon Kellogg as chairman, in the National Research Council, has made a special project of this problem of the gifted student. It has various committees at work and aims to collect and disseminate information on this subject. I desire to acknowledge my obligation to this Division for inspiration and facilities in the work, but the suggestions I am now about to make are not official; they are purely personal convictions gained in my own experience and observation.

In the proposals I am about to make, I shall scrupulously avoid the recommending of any procedure which shall in the slightest detract from the present actual privileges and oppor-

tunities that the non-gifted student enjoys. Indeed, the whole appeal for the recognition of the individual in education is as much for the good of the non-gifted as for the gifted student. I am speaking here from the point of view of the intellectually gifted; but we all know that these have many weaknesses and that there are many other gifts or talents which supplement intellect and in many instances outweigh it. I shall therefore not tolerate any odious comparisons in terms of superior and inferior, and my appeal for the gifted shall not convey the slightest slur or disparagement of the non-gifted; but the fact is that, in education as in charity, there has been a constant tendency to give the first and most ardent care to the comparatively helpless. To this I would add some thoughtful equalization of interest.

The discovery of the individual and the study of his talents in modern psychology has brought forth a maxim which may well be our educational slogan: "*Keep each student busy at his highest level of achievement in order that he may be successful, happy and good.*"

This maxim is so pithy and cogent that we can afford to read it and reread it, accenting in turn each individual word, as every word of it stands for a principle. Thus, we may emphasize in reading, *each, his, highest, achievement, successful, happy and good.*

Keep the moron busy at his highest level of achievement and he will be happy, useful and good; institutions have demonstrated that fact. Keep the gifted student in music or art busy at his highest level of achievement and he may become an artist; that has been demonstrated. But science is slow in applying science to its own procedures. The challenge of educational psychology to-day is this: "Keep the gifted student busy at his highest level of achievement and you may find him a delightful comrade, a contributor to the world's store of knowledge, and a vastly greater man than he could ever have been but for your thoughtful consideration."

To act on the application of this principle, I would urge the extension of the following procedures which have all been tried to some ex-

tent in various institutions but need to be promoted.

1. *Sectioning classes on the basis of ability.* We may say in very rough and conservative terms that, if we think of a hundred college freshmen, chosen at random, and match the extremes against each other, 5 at one end can do more than 5 times as much as 5 at the other end. The next 5 at one end can do more than 4 times as much as the next 5 at the other end. The next 6 at one end can do more than 3 times as much as the next 6 at the other end. The next 9 at one end can do more than 2 times as much as the next 9 at the other end. This accounts for the highest and lowest quartiles. The differences at the extreme are much larger than here represented because one or two at the upper end may be capable of rendering more than ten times the *average* output for the class, while the one or two at the other extremes are quite certain to fail. If, then, we seek for a practical basis for the sectioning of classes, we shall do well to recognize three levels which we may call the *high*, the *middle*, and the *low*, the middle being as large as the other two together.

All too often our educational system is based upon the assumption that, where the great Creator failed to make all human beings equal, it is the business of the school to make them equal. To justify this procedure, the school men have found cover in the argument that this task works toward a democratic ideal; that it represents the rights of individuals; that it is necessary for the successful operation of educational machinery; that it is good for the lowly individual; that the procedure is justified by results. Each of these defenses represents a fundamental error and misconception of fact in educational procedure.

The democratic ideal in education, as everywhere else in life, is not identical opportunity for all, but equal opportunity in proportion to capacity. The genius and the moron do not have quantitatively the same rights to knowledge; they have equal rights in proportion to their relevant capacities (quantitative and qualitative), and one should be as insistent upon his rights as the other.

Among the advantages of such sectioning we

may note the following: it becomes possible to apply in teaching the pedagogical maxim, "Keep each student at his highest level of achievement." This will result in the setting up of fair standards for quantity, quality, content, and method of work adapted to a fairly homogeneous group. This in turn will establish a fair basis for praise and blame. The introduction of fair standards of achievement creates morale in a class. There will therefore be a larger output at all three levels; for such grouping is as advantageous to the untalented student as to the talented. Such progressive segregation is one of the best means of discovering and motivating the gifted student; because he is thrown into vital and effective competition, works at his highest level of achievement, and enjoys freedom for initiative in self-expression, and these associations are likely to awaken in him desire for progress, a sense of joy in achievement, and a feeling of fellowship. The introduction of this method, if properly managed, will not increase the cost of instruction, but may reduce it.² I have pointed out in two articles on this topic³ that there is no insuperable difficulty in the way of conflict of hours and cooperation of staff and that every institution that has given the method a fair trial is continuing it.

2. *Honor courses.* Let each department in which there are progressive teachers set out one or more courses to which admission may be gained only upon evidence of fitness. The principal factor to take into account should be high scholarship, or creative achievement, or both together with health. The standard for passing should be much higher than in an ordinary course. The class may well be socialized and the work so arranged as to challenge the individual to wide reading, verification and defense of his findings, experiment, independent thinking and self-expression. Under no circumstances should the course be limited to lec-

ture or textbook; nor should formal essays or papers be read by the student. It should not furnish an opportunity for the instructor to recite the findings of his researches, although the subject of study will most profitably lie within or around his field of research.

Admission to these courses should be in the hands of a scholarship committee to which recommendation for admission and reports of achievement should be made by teachers. Assuming as a unit of credit three year hours; i.e., six semester hours, the exceptional student might be permitted to take one course in the sophomore year, two in the junior year and three in the senior year, but not more than one course of this kind each year in a given department. Thus the amount of credit in such courses might furnish a better basis for designing honor students for graduation than the present basis of mere credits in ordinary courses. The existence of such courses would act as a stimulus to the gifted student who might otherwise be disposed to loaf. Dozens of varieties of honor courses are being tried in different institutions. This plan has the advantage of flexibility, simplicity of administration and a salable proposition to the student.

3. *Individual work.* Shall the freshman who has read current literature and history extensively and lives in it be forced to ruminate the cud of predigested pellets which form the diet of freshman general history? Shall the gifted student, who, given the freedom of the library, can read up in one half to one fifth the time what is doped out in lectures on special topics, be forced to acquire a specialized knowledge in that specific form and at that set pace? Shall the student who, if given free hands, could pass all college examinations required in a year or two be required to mark time for four years? Or, granted that it is good for him to be in college for four years, shall his horizon be limited to the scope of course units? Shall the gifted student who can learn the two hour assignments in science or history or language in fifteen minutes be encouraged to loaf or play the rest of the time? Or shall he be given a different assignment? Shall the gifted student who can do independent work in li-

² I am, of course, speaking of the larger institutions; indeed, the very necessity for differentiating students may prove to be a decided disadvantage to the small college.

³ In *School and Society*.

brary, laboratory, field, or creative work have his progress restricted by course units?

Such questions are all the more pertinent here to-day because American institutions have answered them in a different way from that in which they have been answered by the older institutions in Europe. The American college coddles the student; laces him into a strait-jacket of forms, and spansks or rewards him somewhat in proportion to his conformity to this corset. Professors talk about academic freedom. Perhaps it is time that we heard from the student about academic freedom.

One wholesome practice is to excuse students from too elementary courses and give them more advanced work. But in many cases there should be another outlet. Students who, on admission or later, give evidence of high capacity for achievement should, on recommendation to the department and approval by the scholarship committee, be permitted to register for individual work as a substitute for required courses, work to be counted for credit as in the course. But the standard of passing should be much higher than for the class work (1) to prevent rush to this privilege, (2) to call for high achievement on the part of a gifted student, and (3) to allow for the effect of cramming. The test should, however, be more plastic and personal than the formal tests on course content. In addition to scholarship, admission to such registration should be based upon evidence of fitness for such independent work. The principle of this type of registration once approved by the faculty, the administration of it should be left largely to the departments, so as to make it simple and flexible.

Departments might find it possible to have syllabi, bibliographies and study hints available as an invitation to individual work. Occasional interviews should be granted, but not for the purpose of telling or teaching. In certain subjects each individual's work might be so motivated and organized as to carry a considerable number of students in this way rather than in class, and thereby lighten the burden of teaching. Departments might also go so far as to recognize voluntary groups of two or more students for cooperative study in

preparation for such tests as the department might set. In every case, the student would have the advantage of working at the highest level of achievement, would be free from the lock-step of the class room, free from the burden of being bombarded with matters which he already knows. Mathematics, history, government and psychology would be good examples of subjects to pursue in this manner. Mathematics is peculiarly a personal affair; it is a skill which the teacher can not impart. In foreign language there is no reason why a gifted student should spend two years in the class room in learning to read French and German; but if he is given time and realizes what it is for, he can read French or German literature and science and live in it and use it to best advantage and thereby lay a better foundation than he could by merely taking a course. Even laboratory courses might well be mastered in this way. Only gifted students can profit by this privilege. Inferior, mediocre or average students need to be nursed and coddled by the methods we now employ for all. The privilege is merely an honest recognition of the fact that there are some who can learn for themselves, without tutor, lecturer or class whip.

4. *Early contact with mature teachers.* Recently, a faculty committee in a university brought in a report representing essentially this: (1) that elementary students should be taught in sections not to exceed twenty-five; (2) that elementary students should be taught by the mature men in the department; (3) that the teaching schedule for these men should be reduced in order that they may have time for research; and (4) that salaries should be raised. One member of that committee, representing a very large department, was asked to prepare a budget for his department embodying these recommendations. Nothing more has been heard of the report. It simply can't be done.

With the present influx of students, there is a tendency to reserve the most inspiring men for the most advanced courses and leave lower courses in the hands of cheap labor. This is especially demoralizing to the gifted student. When a department has from two to fifty sec-

tions in the elementary subject it can afford to so organize the course that the academically mature and successful man is made responsible for the content and method and meets every student in that course at least once a week. This will probably of necessity involve the combination of the meeting of the class in large divisions for lectures, demonstrations, or formal exercises under mature men and personal work with the students in small sections under younger men.

Let me hasten to say that this must not be confounded with the old-fashioned lecture plan with quiz sections; that plan is dead, or should be. But that should not condemn the meeting of the class part of the time in large divisions and part of the time in small sections. Harvard was one of the worst sinners under the old lecture and quiz systems. But to-day Harvard is in some departments setting a model for this type of organization which insures inspiration and thoroughness in the work. The sophomore in economics, *e.g.*, may work under such men as Taussig, Carver, Burbank, Ripley and Day in a single course and carries away something which stays by him through life. The professor in charge of the course himself carries one section made up of the most gifted students.

The plan I commend on the basis of my own experience is to recognize three needs of instruction: (1) inspiration, motivation, and organization of the work; (2) systematic reading, practical exercises, or experiments; (3) self-expression. The first can be achieved in divisions of from one to five hundred by capable men; the third must be done in small sections; and the second may be directed either from the large division or the small section. The first can be done only by a relatively mature teacher who has marked ability in leadership and the power of address. The third may be done by well-selected, young teachers; the second should represent the ingenuity of the mature teacher and the capacity for routine and detail of the young man.

The organization and conduct of the large division work may be in the hands of one man. But where there are distinct divisions in a de-

partment, as in economics, sociology, botany, or psychology, the first year course should be a cooperative affair. There is no need or justification for electives toward a first year course in a department. There should be only one economics 1, one American history 1, one botany 1; for the majority of students take only one course in the department and a course of the second level may well be built upon the general orientation gained in a general survey course. The finest and most extreme embodiment of this principle is perhaps the course in contemporary civilization—a five-hour course required of freshmen in Columbia University.⁴

5. *Time.* There are a number of things that may be done for the gifted student which can not be prescribed but may be included in the general faculty policy of liberality toward the few students who give unmistakable evidence of exceptional achievement. One of these factors is time.

In discussing the gifted student problem, a professor who spoke with a German brogue said, "Vot do ve professors vant? Ve vant time. Vot does the gifted student vant? He wants time." And he was right. The gifted student wants time to pursue his ideal; and he can best get that by some generous policy of exemption from formal training. This comes hard. I well remember what precious hours our faculty wasted in trying to keep Mr. Steffanson, the now famous explorer, from submitting the evidence showing that he could acquire on short notice those units of learning which we have so logically prescribed in our four year course, all of which he could have met in a year or two while he was doing some creative work on the side. (As a matter of fact he did get permission to do that very thing and succeeded.).

This sounds like iconoclasm. It disturbs the dean and the registrar and the professor. As a practical administrator I am not calling for any great or sudden revolutionary procedure;

⁴ The October number of the *Bulletin* of the Association of American University Professors contains valuable material on "Initiatory Courses for Freshmen."

but I should like to enter a plea for the recognition of opportunity for reasonable treatment of the gifted student commensurate with his exceptional powers; and one of the conditions for achievement is leisure and the privilege of working at your own pace.

To the now traditional practice of allowing excess registration in proportion to quality of credit should be added the proviso that an excess schedule must include an honor course each year, and general health and social orientation should be taken into account. If this is done, the student may combine the saving of time with the winning of distinction—a type of distinction which has real value. A flexible scale of excess registration may then safely have such range that the very gifted student could complete the college course in three years if he so desired.

Comradeship. The first and greatest need of the gifted student is comradeship or fellowship in the late adolescent pursuit of his ideal if it be the search for truth. Each of us who has had any degree of success in original work can look back to little incidents where a teacher or a more advanced fellow student conveyed the sentiment; you are good enough to be in my company; see with me this vision; share with me this harvest; let us seek truth first hand; I want you to fall in love with my problem; over the mountain top there is light. This can not be achieved through any formal academic procedure. Probably less than one fourth of the college teachers in the United States are capable of participating in this privilege, and yet the principle needs to be urged upon the academic community in order that those who have this interest at heart may not trust the machinery to do what it can not do; may not underestimate the great significance of little things in this direction, or may not in the interest of modesty or academic courtesy hesitate to exercise this privilege. It is a personal affair and must therefore take the course of natural, personal values, privileges, and rewards, given freely for the love of it, living for it as a father lives for his son.

For this reason, formal academic privileges and procedures can not be prescribed or even

enumerated. Comradeship must be personal and warm, involving privilege. But the outward organizations must not be ignored. Invitation to the home; participation in small groups, clubs, and societies; the enjoyment of special laboratory and library privileges; the exemption from hampering formalities; the encouragement of rewards of all kinds; the stimulation of competition; the organization of rigorous academic wrangling and criticism; the participation in the reading of manuscripts, the conduct of experiments, scientific expeditions, and learned societies. These things are all of very great value to the student who has been taken into comradeship for research as a neophyte. They come to him because he has been admitted to comradeship and in return he gives his best.

He needs counsel to curb his enthusiasms, to acquire fundamental habits and knowledge, to lay good foundations through training in the fundamentals, to fit himself into the social body in which he lives, to care for his health and manners, to seek reasonable outlet for his ingenuity, to keep from being a hermit or a prig, to keep in the humble attitude of a master who is not puffed up over his achievement.

C. E. SEASHORE

STATE UNIVERSITY OF IOWA

WHAT SHALL BE TAUGHT IN THE FIRST YEAR OF COLLEGE CHEMISTRY?¹

THERE is much uncertainty among college chemists as to the proper treatment of freshmen, some of whom had chemistry in high school, while some did not. With a class not exceeding one hundred and a somewhat limited teaching staff, there is no better method than to put them all in the same class with the same text. No apology need be offered for such a procedure. In such small classes the teacher can keep in close touch with the individual student and vary the program to suit individual possibilities. This is especially easy in the laboratory drill where the experiments may be

¹ Paper presented at the Pittsburgh meeting of the American Chemical Society.