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"PROGRESSIVE EDUCATION" IN THE TEACHING OF PATHOLOGY[1]

IN an article in the *Atlantic Monthly* of February, 1921, Mr. Stanwood Cobb describes "A new movement in education." The type of education which he considers has been given the name "Progressive Education." Although the article deals particularly with education in the primary grades, nevertheless, the question arises as to whether or not the principle which directs this movement may have application in more advanced technical education. A fundamental aim is to have the interest of the student aroused before his work is assigned. Although it might be presumed that the mere fact of a student's entrance into a school of medicine presupposes that his interest is sufficiently aroused to dictate the most active work in the furtherance of his technical training, yet all those who have taught in such schools know full well that such is not necessarily the case. The motives underlying the student's selection of a profession sometimes are extrinsic in origin; the purpose may have originated in the minds of parents or others. Again, the aim of the student may be different from the highest ideals of professional work. All too often the student regards certain of his subjects, particularly those of the preclinical years, as of little importance. Therefore, it becomes necessary to arouse interest on the part of a considerable number of students in any given class. Fundamentally, it might be assumed that were the teachers of the preclinical subjects to emphasize continuously the importance of these materials in the subsequent clinical work of the student that would be sufficient, but long experience in teaching pathology where this view has been particularly emphasized shows that even this

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method is not sufficient to attain the ideal. As a corollary to arousing interest on the part of children comes the proposition that "the best way to get the child to learn a thing is to make it want to learn that thing." These fundamentals of the progressive method of education in the earlier grades are attacked along four lines. They include (1) competitive games in which there is some opportunity for action, (2) the abandonment of the formal recitation, (3) a more flexible program, (4) correlation of book knowledge with the daily life of the child.

It is well understood that not only is primary education in an experimental stage but judging from the numerous attempts to elevate the standards of medical education, certainly this branch of technical training is also passing through a period of experiment. When one considers the reports presented before the Council on Medical Education in the spring of 1920 it becomes apparent that the same is true of the various subjects included in the medical curriculum. The question naturally arises as to how far the fundamental principles of progressive education may be applied to the subject of medicine as a whole or to any of its individual branches. The present communication deals only with the application to the course in pathology.

The principle of competition has been applied over years in the assignment of grades for work. In the minds of most teachers this is insufficient and often leads simply to intensive narrow work toward the attainment of high grades. Many students recognize in themselves a certain limitation of intellectual power and are not stimulated in any sense by the apportionment of grades. They recognize that all too often the students with highest grades are not necessarily the best practitioners or investigators. The same applies in the posting of excellent drawings or notes. Competition in actual practical work in pathology may, however, serve a useful purpose. In our own courses this is attempted by comparative efforts in actual work. Students are required to demonstrate to their classmates the fresh organs from recent autopsies. In certain instances they demonstrate microscopical preparations and the same principle is applied in the reporting of experiments. No grades are assigned for these efforts, but instead the attempt is made to stimulate the student's pride in his own attempts.

The abandonment of the formal recitation has met in our hands with the greatest success. Even with the utmost informality there was constantly before the student in ordinary recitations the desire to make a good impression on his teacher. It must be recognized, however, that in technical training there is in every subject a considerable content value and in the particular subject under consideration not only is this true but the aim of the teacher must be to stimulate the student to thinking logically in terms of medicine. Extremely successful in our work has been, under the stimulus of Mr. Cobb's article, the introduction of recitations conducted by the students. In the subject of special pathology this includes review recitations of the embryology, morphology, and physiology of organs and systems followed by similar recitations in pathologic disturbances. In adapting the method, the students elect for each recitation a director who is given sufficient time to prepare for this task. The students are requested to select their directors rather from the point of view of organizing ability and clearness and rapidity of thought than from the point of view merely of high class standing. This has resulted in a marked elevation of the standards of recitation. The results are shown in a greater cooperative spirit on the part of all concerned, a greater seriousness of purpose and attention and what appears to be a clearer understanding of the difficulties which each class faces. Naturally, such recitations must be closely supervised because of the necessity for maintaining accuracy. It might be objected that such a method leaves no room for the stimulation of the student's imagination. In practise, however, it is found that many questions brought up in the course of these informal discussions serve admirably in exciting speculation as to origins, process, results and relations of disease. Furthermore,

the lectures which are given can serve this important purpose equally as well as recitations. The informal recitation has the further advantage of permitting a better evaluation of the ability of the individual student than is possible with the more formal and more autocratic recitation conducted by the teacher. Inherent reticence of the student often prevents an answer to a teacher's question and yet permits of an adequate answer to the same question from one of his colleagues. The protection of the community and the maintenance of high standards in a school of medicine demand that the teacher form a proper estimate of the students' ability and this estimate can be materially aided by observation in the democratic and informal recitation.

A certain amount of flexibility in program is provided for in offering elective courses in the various divisions of special pathology. Considering the content value of a technical subject, it is difficult to adopt the program of flexibility to any very wide extent. Nevertheless, the principle can be applied without too great a sacrifice. Instead of assigning a certain number of slides for each day, a certain number of days can be given over to a particular subject; the total number of slides or other material can be indicated and the proportionate division of the work left to the student's personal wishes. Recognizing the fact that drawing illustrations of slides or other material has considerable value, nevertheless, flexibility may be adopted here. For example, the students of our present class have been told that fifty drawings are required in the subject of special pathology. Their selection of the subjects to be illustrated is of far more significance than is actual technical skill in drawing. No particular forms are given for the report of experiments and the method of presenting these reports gives the student complete freedom and serves as a guide to his grasp of the subject.

The correlation of the material acquired in pathology to the daily affairs of the student's and physician's life is a matter which has given the writer considerable concern. Fundamentally, this means the interpretation of pathology in terms of clinical medicine. The introduction of experiments to illustrate in animals these disturbances has been of the utmost vlaue. Simply performing the experiments is insufficient; they must be interpreted so as to demonstrate their application to human disease. The method adopted in our work has been described.[1] Even this proves insufficient and every opportunity must be taken to impress on the student the fact that the material he deals with comes from living patients. Correlation can also be approached by means of the clinical pathological conference, as adapted to the needs of students. In our courses eight periods of one and one half hours each are employed for this purpose. It is possible as a rule to cover two or three cases in each period. Two students of the third year class are required to present the history and differential diagnosis of a case that has recently come to autopsy. Following the discussion of this presentation, the organs from this patient are demonstrated by two other students either of the same class or of the second year class; this is succeeded by an attempt at correlation of symptoms and morphologic disturbance, as well as a discussion of the sources of error in clinical diagnosis. These exercises have proven to be most successful. In addition to these conferences the second year students at the end of the studies of the disease of the heart and of the diseases of the kidney take part in exercises which were first utilized with the cooperation of Dr. F. W. Peabody and are now being practised with the cooperation of Dr. R. W. Scott. These exercises have been described in detail[2] but they can be summarized by an illustration from a recent exercise. The students gathered in the

[1] Karsner, H. T., "The function of the experimental method in the course in pathology," *Boston Med. and Surg. Jour.*, 167: 511, 1912. Pearce, R. M., "The teaching of experimental pathology and pathological physiology to large classes," *Bull. Johns Hopkins Hospital*, 22: 249, 1911. Karsner, H. T., "Teaching the pathology of function," *Jour. Am. Med. Assn.*, 75: 361, 1920.

[2] Karsner, H. T., "The experimental method as utilized in the clinico-pathological conference," *Boston Med. and Surg. Jour.*, 170: 723, 1914.

amphitheater of City Hospital and demonstrated during the first hour the gross morbid anatomy of several fairly typical heart lesions. Recitation was then conducted by a student on the normal physiology of circulation. This was followed immediately by students' demonstrations of the effects in dogs of hydropericardium, of acute myocardial degeneration, of aortic stenosis and of aortic insufficiency. In line with the student's discussion of the normal functions of heart muscle Dr. Scott presented and discussed a few electrocardiographic tracings. After a brief rest the students then under Dr. Scott's direction examined three living patients exhibiting murmurs, thrills and cardiac arrhythmia.

It is hoped that as the experiment in progressive education is more widely applied to pathology the results will be improved, but even with the experience now at hand there is little doubt that this method has an application in pathology and that in so far as it has been attempted it has been proven to be eminently successful. Certainly, the idea is practicable and its success will depend upon the teacher's interest in the educational side of his subject, his willingness to grant as large a measure of freedom as possible to the students' own effort, his keenness in careful supervision and his confidence in the propriety of the idea.

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A NOVEL MAGNETO-OPTICAL EFFECT

(Further Investigations)

In the former account of this novel effect, it was pointed out that a microscopic examination of the iron arc smoke deposited on a glass surface gave evidence of the existence of fine particles of iron compound arranged in short chain sections of bead-like relation.

It is now thought that this peculiar formation may have its origin in the outer envelope of the arc flame where the particles are formed, and where they are lined up around the arc stream by the circular magnetism surrounding the current conducted by the hot vapor stream of the arc. The particles, being magnetic, would tend to form chains or rings surrounding the arc. These would not be stable, however, but would float away as they became shattered by gas currents, and remain only as short lengths of particles held together. To throw light on this possibility, a small vertical, hollow cylinder of plaster of Paris open above was arranged with iron electrodes (for forming an arc) passing through its sides and meeting in its center. By passing the current of a storage battery giving about 50 volts through them in contact and separating them, an iron arc could be produced at will within the plaster cylinder. The dimensions of the cylinder were such that a microscope slide 3″ x 1″ could rest across the open upper end of the plaster cylinder, only partly closing it, the slide lying horizontally above the arc electrodes at a distance of about 3 cm. Such a slide could receive a layer of smoke on its under surface when the arc was formed below it. The microscope in that case showed only a confused deposit.

When, however, there was placed above the slide a strongly excited electromagnet with its poles resting on the upper sides of the slide or close thereto, such poles being about 3 cm. apart, a smoke deposit of a remarkable character was produced. Even as examined by the unaided eye in diffused light, there was decided evidence of a structure or striation. When, however, the microscope was used, with even comparatively low powers of about 300 to 400 diameters, there was disclosed a decided striation seemingly composed of brownish particles in strings extending over the slide and following the direction of the field. There was noted a surprising regularity in the distribution or spacing of the striæ, as if the surface was covered with fibers laid on systematically side by side.

There were, however, curious objects composed of small spheres (evidently globules of iron) strung together in a line of two, three, four or more, such spheres having no uniform size. Most of these iron globule groups lay, of course, in the field direction and were very