

## Scientific Management and the Gary Plan: A brief history and analysis

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### Abstract

Scientific management of education in the early 1900s began as a response to the demographic changes in the United States. The currents of intellectual thought at the time, together with these demographic changes, resulted in the development of the Gary Plan in Gary Indiana. Specifically, these currents of thought were that an egalitarian universal education system was necessary for democracy, that this system must be as efficient as possible, and that the way to create an efficient system could be found by mimicking the industrial factories emerging in America. Two further aspects of this context considered here are Thorndike's stimulus-response conditioning theory, which formed the basis for education, and Cubberly's standardized testing, which formed the basis for quality control. This paper describes the history of scientific management and the Gary Plan within this context. Further, this paper analyzes and evaluates the lasting effects of scientific management and the Gary Plan.

Keywords: scientific management, Gary Plan, Bobbitt's Elimination of Waste in Education, Davenport's Education for Efficiency, Thorndike's stimulus-response theory, Cubberly, progressive era, scientific curriculum

### I : Introduction

The Gary Plan was an education system implemented in Gary Indiana in 1907. It was part of a wider movement in education called 'scientific management', and can trace its origins to the progressive era and the educational theorist John Dewey (1859-1952). Scientific management refers to both the application of efficiency analysis of systems to education, and to the adoption of theories from behavioural science. Although scientific management had its beginnings in the progressive era, it was a radical departure from the emphasis on individual growth, critical thinking and experience. In some ways it became the antithesis of its parent, the progressive movement. The Gary Plan, the first full scale application of scientific management, had considerable success; by 1920 over 200 American cities had adopted

the system. The Gary Plan also had a significant long-term impact on the development of education in the US and around the world. The emphasis on efficiency, the incorporation of the needs of the workplace, and the promise of egalitarian education make it attractive. However, the Gary Plan was also a specific response to a set of unique social challenges and was couched within a somewhat limited intellectual environment. It was eventually discarded for these reasons. This paper will explore the context of the Gary Plan and critique this system within that historical and intellectual context, describe the lasting effects of this system, and evaluate the system as a whole.

To begin with, let's place the Gary Plan within the broad strokes of curriculum theory. Schubert (1986) in *Curriculum: Perspective, Paradigm, and Possibility* postulates that all educational systems answer four basic questions. How these questions are answered creates the educational paradigm. These questions can be expressed as diametrically opposed choices: Which is more important; the development of the individual or the needs of society? Is the focus on the process or on the outcome? Is the structure of the power relationships democratic or hierarchical? Is knowledge seen as a synthetic whole or as a series of discrete units? From this premise it follows that if one decides that the needs of society are foremost, then the skills that are needed by society should be taught. If one decides to focus on the ends, then the development of the individual is not an issue. If one decides that schools should be organized hierarchically, then democracy is not an issue. If one decides that knowledge is composed of discrete particles, then synthesis is not important. The universal education system that was created in the USA in the early 20th century, scientific management, was one way of addressing these dichotomies.

## **II : The Demographic Situation**

Scientific management began in the US in 1907. This was the time when public education in America was expanding rapidly. This growth was related to immigration, but the exponential increase did not occur until compulsory education legislation was introduced in the early 1900s that required, in most states, children to go to school until the age of 14. (Graham, 1974) One of the main reasons for this legislation was to put an end to child labour practices. Before the early 1900s many children worked, either in factories or mines, or on family farms or large commercial agricultural plantations. With the enforcement of attendance laws, the student population burgeoned far beyond the physical capacities of the school system. As Callahan (1962) writes:

... the rapid increase in enrolment due to the growth of population and to the improved attendance legislation and enforcement procedures added to the cost of education, especially in terms of the additional buildings and classrooms which were necessary. (p. 135)

To give a sense of the increase in school attendance in this period, let's look at some attendance figures. In 1890 there were just over 220,000 students in high school in all of America. In 1900 there were 500,000. (Cuban, p. 25). This exponential growth continued throughout the early part of the 1900's. By 1930 there were 1,000,000 students in New York City alone. (Cuban, p. 45) In 1890, the schools enrolled 1.6% of the population, by 1926, they enrolled 15.2%. (Thayer, 1990) This demographic problem created an environment where efficiency would become highly valued.

The second demographic problem was that the student population of was more diverse. Not only the future doctors and lawyers required education, but also the future steel workers, technicians and other skilled workers for the industrial sector. America was attracting immigrants from all over Europe, and there was a perception that a shared educational system would help overcome the problems posed by this diversity (language, cultural identity, sense of being an American, etc). The diversity of the student population meant that the narrow curriculum of a classical education which emphasized Greek, Latin and classical literature would be inappropriate for industry and nation building.

### **III : Eugene Davenport and Education for Efficiency**

Scientific management of education and the Gary Plan was a response to this demographic situation. Underlying this plan was a set of prescribed beliefs and values. These values are expressed by Eugene Davenport, an agricultural professor at the University of Illinois in the early 1900s, who became a leading thinker of scientific management. His thinking typifies the intellectual environment of this era. From his book *Education for Efficiency* one can deduce the concerns, beliefs, and ideals underpinning this movement.

One of the primary issues for Davenport was that education should be a state, rather than a personal, responsibility. Before universal education, it was up to each family to pursue the best education that they could afford for their children, making education a familial, rather than a societal, responsibility. "We have come to realize in the last analysis the child belongs to the community, and public welfare requires that he be educated." (Davenport, p. 12) This was a profound change and a remarkable statement. Why does public welfare require that he be educated? According to Davenport, "the interest of the state requires that the ratio

of individual *efficiency* in all lines shall be constantly increased.” (emphasis mine) Davenport reflects the prevalent thinking of the time that the responsibility for education rests squarely on the shoulders of the state. The idea of education as a state responsibility was not a given at that time. In much the same way as health care is not seen as a state responsibility in America at the present, so to at this time education was considered to be the responsibility of the family. Davenport’s answer also points to another central theme of early American universal education: efficiency. This is a subject we will return to later.

A second issue prevalent in Davenport’s writing is that education is a democratic necessity. He believed that for a democracy to function, men who vote must be literate enough to understand what they are voting for and about. “. . . all thinking men see clearly now that whether the education be classical or industrial, it is alike a part, and an essential part, of the successful development of a young, strong, and virile democracy.” (p. 45) This is a clear break from the past, when secondary education was perceived to be the luxury of the wealthy and powerful. Davenport reflects the belief that in a democratic society, education is necessary to create an egalitarian society where success would depend more on intelligence and hard work, rather than wealth, and where the distinctions created by wealth would be less profound. He writes “I would have it so that the occupation of an American citizen may not be known by his dress, his manner, his speech, or his prejudices.” (p.33) The central theme of Davenport’s thinking, and of American educational thinking at the time, is that the history of the philosophy of education, from Aristotle’s Academia to their present, the early 1900s, is the story of the common man struggling to gain an education, and through this effort, to become free. “Now the demand for industrial education is not a piece of academic evolution; ... It arose as one of the demands of the masses of men for better life and opportunity.” (p. 39)

This ideal of universal education as a state responsibility, and the belief that it is the path towards freedom and democracy, on both an individual level, and at the state level, is central to the implementation of scientific management of education in America. However, there was an equally powerful concept that had an even more significant effect. Davenport’s third concern, after freedom and democracy, was for *efficiency*. In fact, Davenport’s seminal work, *Education for Efficiency*, starts with this definition:

Among all the purposes that education may be expected to serve, it is perfectly clear that individual and community efficiency is paramount; and, moreover, that this efficiency is general, having equal application to the industrial and to the non-industrial, to the vocational and to the non-vocational. (preface: p. iii)

This quote is revealing in a number of ways. The theme of efficiency is obvious. Davenport

puts individual and community efficiency together as part of the same whole. Individual efficiency within Davenport's writing, and the scientific curriculum as a whole, meant that the individual learned what was needed to be a productive member of society. In other words, if the student was going to become a technician, he should learn those things necessary for technicians. Community efficiency meant that the educational system should produce the required number of people with the required skills. In other words, if the community needs more steel workers, then the educational system should produce them. These two themes, that the individual shouldn't waste his/her time learning things that have no practical use, and that society shouldn't waste its educational resources producing skills and knowledge in people that don't need them, is central to the scientific management of education.

The idea of 'community and individual efficiency' leads the way to deciding on content for this educational institution. As outlined in the introduction, the answer to the question of what to teach has a profound impact on all other issues relating to education. Previously, education had been mainly composed of subject matter appropriate for lawyers, businessmen, politicians, or doctors. Davenport: "It did not take the common man long to find out that the learning of the cloister was not fitted to his necessities..." (p. 78) Davenport is expressing the opinion emerging at that time that the education of the elite, classical education, was not appropriate for the masses. New subject matter and new content was necessary. Davenport emphasizes repeatedly that education must be relevant for the 'common man' and that it must teach things that are useful in terms of finding useful and productive work. "... no man could find anywhere on earth courses of study to fit himself for usefulness outside the so-called learned professions, good and useful in themselves, but insufficient for all the needs of a high civilized people." (p. 34) This statement clearly shows the connection between scientific management and the progressive education of John Dewey. "Anything which can be called a study, whether arithmetic, history, geography, or one of the natural sciences, must be derived from materials which at the outset fall within the scope of ordinary life-experience." (Dewey, 1938, p. 73) Davenport goes on to say that a liberal arts education is inappropriate for those that do not intend to go on to university.

There is an apparent conflict here between the two important threads of his thinking. On the one hand, Davenport believes in education as a great equalizer, "I would have it so that the occupation of an American citizen may not be known by his dress, his manner, his speech, or his prejudices." (p.43) and on the other hand there is the ideal of education as a way to create an "efficient individual" who learns only what is needed to work. Clearly, in many instances, these two ideals are going to be at odds with each other. Davenport does not offer a way out

of this contradiction except that when these two ideals run into each other the tendency was to err on the side of efficiency, rather than on the side of equality. The primary emphasis was the creation of an efficient society rather than a democratic one.

Implicit in Davenport's writing, and in the thinking at the time, is a focus on the needs of society over the intellectual development of the individual. It could be argued that the needs of the individual were being addressed, in that this education will help him find a job, and do that job well. As stated by Davenport: "If the schools make the most of their opportunity, they will develop into a great system capable of training the masses of our people not only industrially but for all the duties of life, ..." (p. 31) Davenport is more concerned with developing an efficient society than with the intellectual development of the student, and it is here that he diverges from Dewey and progressive education more sharply. His concern is more with efficiently creating workers for the industrial factories and citizens for the USA. In fact, he calls a liberal education dangerous for the average person: "... we may well tremble when we see a whole people gorging themselves with a mass of knowledge that has no application to the lives they are to live, for this in the end will breed dissatisfaction and anarchy." (p. 28) The focus is on the system, not on the individual; what matters is the end result for society, not the quality of the educational experience.

Implicit in this answer is the premise that the *raison de etre* for education is the outcome: the adult life of the student. The life of the child while in school, the quality of the educational experience, is not seen as a valid, unique and important process in and of itself. "Each is after the instruction which will best fit his future needs." (emphasis added, Davenport, p. 23) Those needs are the needs of the adult, not the child. Education was not viewed as a time of change and growth in the child, requiring nurturing and care, but as the opportunity to train the student in skills that would be needed as an adult.

Throughout Davenport's writing there is the sense that he believed what they were doing was great and epic. He saw himself as engaging in a world changing endeavour. He writes: "We are now engaged in the most stupendous educational, social, and economic experiment the world has ever undertaken - the experiment of universal education ..." (p. 45) This optimism is typical of scientific management. These early American educational thinkers had a sense that what they were doing was significant; that they were breaking new ground and moving society in the right direction. The writing from this period is characterized by this extraordinary sense of optimism. It can be characterized as an educational version of the American belief in manifest destiny, which restricted them from questioning their assumptions and prevented them from focusing on the intellectual development of the students

as individuals.

The beliefs and goals of this period are evident: a solution to the demographic problems was needed in line with three important ideas: education as the responsibility of the state, universal education as necessary for democracy, and an efficient education system. The result was the development of a system dubbed “scientific management” and its physical manifestation, the Gary Plan.

#### **IV : The Cult of Efficiency**

Efficiency lies at the heart of understanding the scientific curriculum, and deserves to be put into context. This includes efficient students, efficient teachers, and the efficient use of the school plant. The American industrial complex was expanding exponentially in the early 1900s. Industrial attempts at dealing with efficiency questions, in factories, mines, and commercial agriculture, provided possible models for how to develop a more efficient school system. Efficiency moved from the work place, especially the steel and automotive factories, into the sphere of education. The method of transferring ideas from factories to schools was simple. School boards began to hire the directors of corporations as administrators and advisors from the business community starting in the mid 1910s. There was a belief that business leaders were the only people capable of creating an efficient school system because, first, they understood efficiency, and second, they understood the needs of the emerging industrial society.

This threatened the autonomy of the school boards, but they seemed powerless to exert themselves in this intellectual climate. Callahan, in *Education and the Cult of Efficiency*, explores the interrelationship of business and education during this period. He writes:

What was unexpected was the extent, not only of the power of business-industrial groups, but of the strength of the business ideology...and the extreme weakness and vulnerability of school administrators. I had expected more professional autonomy and I was completely unprepared for the extent and degree of capitulation by administrators to whatever demands were made upon them. (p. 12)

Business had wrested control of education. It is not surprising, then, that Gary Indiana was the birthplace of the platoon school. Gary was at the hub of American industry and steel manufacturing.

One of the contributors to this movement was Ellwood Cubberly, a leader in the development of scientific management. Cubberly can be credited with the development of

testing: the measurement of schools, students, and teachers, as a way of maintaining quality control and standardization. He, along with others, used the analogy of industrial production to explain and improve the educational process. He writes in *Public School Administration* (1916): “The Gary plan calls for good organization, along lines which school men are not commonly either familiar with or capable of; large executive capacity, imagination, and clear insight into community needs. . .” (p. 130) There was a belief that business leaders with their experience in running profitable companies, and experience with 'scientific' management, i.e. efficient management, could provide solutions for the challenges facing the American education system. This attitude is summed up by Tanner (1990): “Arthur Twining Hadley, President of Yale University, who, in his book *Standards of Morality* (1907), proposed that businessmen assume a larger role in the solution of contemporary social problems in return for protection of their vested interests.” (p. 182) From here it was a small step to suggest that education be responsive to the needs of the business community. At first, business leaders were involved because they knew how to manage a vast, complicated system. Very quickly, however, *management* of the system changed into *control* over curriculum content. The assumption was that the business community knew, not only how to manage a system, but also what kind of 'product' society required. This in effect put the educational system at the service of their service.

## V : The Committee on the Economy of Time

In 1911, the Committee on Economy of Time was created by the National Education Agency's Department of Superintendence to help bring business efficiency into the school system. It was through this committee that American universal education was transformed. (Tanner and Tanner, p. 184) The efficiency of the factory was brought over to the school system both in terms of the system and in term of subject content.

Two of the main contributors to this committee were William A. Wirt, as already mentioned, and Franklin Bobbitt. Wirt had been a student of John Dewey and so was familiar with the philosophy of the progressive era. In 1911 he was superintendent of Gary Indiana in the heart of the steel industry. He was attracted by the idea of bringing in the study of nature, art, music and industrial education to the curriculum through the system of departmentalization. (Callahan, p.129) He thought he could combine Dewian philosophy (a focus on making education applicable, meaningful, and democratic) with an efficient use of the school 'plant' (as it was then known) creating a 'platoon' school.



Bobbitt was the first educator to intensively apply the principles of scientific efficiency to the demographic problems facing the United States. In *Elementary School Teacher* (1912) he defines exactly is meant by scientific management of education:

A first principle of scientific management is to use all the plant all the time. A second principle of scientific management is to reduce the number of workers to a minimum by keeping each at the maximum of his working efficiency. A third principle of efficient management is to eliminate waste. A fourth principle of general scientific management is : Work up the raw material into that finished product for which it is best adapted. (p. 132)

The title of the article was *The Elimination of Waste in Education*. Bobbitt continued to be the main contributor to the development of scientific management and was instrumental in the endorsement of the platoon school by the Bureau of Education of the Department of the Interior in 1914. (Callahan, p.135)

Another significant contributor to the efficiency drive was W. W. Charters. He and Bobbitt agreed on the general idea of the platoon school, but disagreed on what was to be taught. Charters believed “a philosopher sets up the aim and the analyst provides only the technique for working the aim down into the terms of the curriculum.” (Tanner and Tanner, p. 189) In other words, Charters did not believe that society would be best served by putting the educational system at the service of the business community. Bobbitt believed that the analyst should decide both the technique of achieving the aim, and also the aim itself, built on a scientific study of society. Bobbitt (1912) “. . . we can determine what people *should* do by identifying the things they do.” (p. 132) Charters eventually lost the argument; the analyst now controlled the education system, putting business interests at the fore of the curriculum. This was due to a large extent to the psychological theory of Edward L. Thorndike (1874-1949).

## **VI : Edward Thorndike’s Stimulus Response Bond Theory**

Thorndike became a central figure in this movement and his stimulus-response bond theory affected scientific management as much as did any industrial-business concerns. Thorndike believed that all learning (training and educating being equal) is essentially ‘conditioning’. That is, when a specific stimulus is experienced the subject is conditioned to respond in a specific way out of many possible responses. When a desired response is rewarded, the response will be repeated every time that stimulus is experienced. This is called the stimulus-response

theory. In Thorndike's words: "Between the situations which he will meet, and the responses which he will make to them, preformed bonds exist." and "They are the starting point for all education or other human control. The aim of education is to perpetuate some of them, to eliminate some, and to modify or redirect others. (*as cited in* Thayer, p. 214)

Thorndike believed that all learning, even the higher cognitive functions, can be reduced to the development of stimulus-response bonds. In an age that valued mechanism and consistent outcomes, this theory was very attractive. Adding to its popularity was the claim that this theory was 'scientific', a claim that has since been challenged and generally discarded in educational circles, the main criticism being that his idea of the mind was actually a description of behaviour. But even so, the *belief* that it was scientific, coupled with the certainty of the beneficent character of American education, was enough to guarantee its success and adoption in the early American school system. Thorndike's theory was studied by large numbers of prospective teacher in teacher colleges across America. Thayer: "Thorndike's psychology became for many years virtually the official psychology in schools of education." (p. 214)

Thorndike's theory of stimulus-response bonds was closely linked to the scientific currents of his day. Darwinism had emerged on the scene as the most powerful natural law ever discovered, and Thorndike logically applied Darwinism (the survival of the fittest), to learning. Thorndike's theory was essentially survival of the fittest *response*. All responses, like all mutations in the biological world, are possible. But that only those responses which are most adapted to their surroundings, i.e. fit the circumstances the best and are rewarded, will survive. It is the teacher's role to train the student to have the best response to all possible stimuli he is likely to encounter as an adult in order to create the appropriate bond. In this paradigm the teacher became an 'educational engineer' (Bobbitt's term). It became the educational engineer's job to identify which types of responses were needed by the business community. It became the business community's responsibility to direct the school from above to be more efficient with the use of space, time, money and manpower, and from below by directing the curriculum. In this way, society would be engineered.

Engineering society was a genuine concern of Thorndike's. His theory of education and stimulus-response bonds was also tied to his theory of eugenics. He believed that the human race could escape from what Walter Lippmann called 'drift'. This was "liberalism, fate, inefficiency and randomness." The opposite was "mastery, direction, control, and commitment to science". Thorndike believed a better race of humans could be developed through education and breeding. He believed that in a few generations of scientific education and breeding

the average American IQ level could be raised by 50 points. Thorndike writes: “As a rule, breeding better intellects will mean breeding men better in other respects as well. The danger of deterioration in social conditions as a result of breeding for intellect or character is trivial.” (1931, p. 188) Thorndike’s theory of eugenics, stimulus-response, and intelligence are all tied together: “The scientific study of human nature by the idealists and reformers and the development of finer standards of success in business will, it may be hoped and believed, produce a much better distribution of learning.” (Ibid. p. 189) Thorndike’s impact on the development of scientific management and the Gary Plan is just as significant as the demographic issues, the rise of the industrial sector of the economy, and the belief in efficiency. These combined to change every aspect of education: administration, class size, use of time, the role of the teacher, the content of the curriculum, and even perceptions of the student.

## **VII : The Gary Plan and the Platoon School**

Scientific management found its greatest expression in the platoon schools of Gary Indiana. In 1903, Charles Eliot, President of Harvard, published *Full Utilization of the Public School Plant* which outlined the basic idea of how to organize such a school. William Wirt, as already mentioned, was the superintendent of Gary at the time. The Gary Plan called for the establishment of ‘platoon’ schools which were the physical realization of Eliot’s ‘Public School Plant’ plan. This platoon school had all of their classrooms in use at all times. Teachers taught all day, from 8 a.m. to 5 p.m. and were supposed to do all of their preparations, marking, and other paper work during ‘study periods’ when the students went to specialized classes. Teachers were not to take their work home with them, but treat their job ‘as other classes of workers’ do. “They are to do paper work during the study periods and they are not to take books or papers home at night.” (p. 265) The movements of the students and the teachers in the platoon school were carefully orchestrated and complex. Classes were enlarged from 30 to 40 or more students, divided into clearly demarcated age levels, and students rotated throughout the day from room to room in platoons. Wirt wrote an article in 1911 called *Scientific Management of School Plants* published in the American School Board Journal in which he outlined this mechanistic school system. About a year later Bobbitt wrote *Elimination of Waste in Education*, published in the same journal. These three seminal works become the basis for the Gary Plan. In 1908 there was one platoon school. By 1914 there were 136 platoon schools in 37 cities and 14 states. By 1929 there were 1068 schools in 202 cities with 730,000 students, making it the dominant form of education at the time. (Callahan, p. 130) The school

became an efficient factory churning out efficient workers for American industry.

The question of what to teach, now that the 'cloistered' subject matter was to be replaced, was answered by the business community. Industry was given the job of surveying themselves to find out their own needs. It was believed that this created 'scientifically' determined job specifications. "We shall have for the first time a scientific curriculum for education worthy of our age of science." (Bobbitt, 271) These job 'specifications' were then 'conditioned' into the students according to Thorndike's stimulus-response theory. The job of the educational researcher was to analyse all productive adult experience and define them as isolated tasks. The role of the teacher was to program the correct response into the student through repetitive task training so that these tasks could be done efficiently. As Peters (1930) writes in *Teaching Ideals*: "Curriculum's overall goal is the acquisition of a large aggregate of 'hair - trigger sets' for responding to the particular problems that will confront the educant in the future." (as cited in Tanner and Tanner, p. 188)

What did the parents think about these changes? It was often less than positive. Callahan quotes from a letter written by a mother who had withdrawn her child from the school system. She writes: "It looked to me like nothing so much as the lines of uncompleted Ford cars in the factory, moving always on, with a screw put in or a burr tightened as they pass, standardized, mechanical, pitiful." (p. 146) And, in New York City, students and parents rebelled against this system when the Gary plan was implemented there. This revolt did not last long, but this episode and the above letter help highlight the fact that this radical new system was having a demoralizing effect on the private life of families. It caused social and psychological suffering and diminishing the role of the family in American society and education.

Rigid adherence to the platoon school system died out by the middle of the 1930s. Other paradigms more responsive to the needs of individual students and more responsive to the concerns of parents were introduced. Scientific management slowly receded. This is not to say that it went away, for many of the dilemmas of the early 1900s (a diverse population, large numbers of students, the friction between a liberal education and job training, a huge discrepancy between the education of the wealthy and the poor) are still with us today. The 'no child left behind' policies of the Bush administration are a clear response to these problems and demonstrate a resurgence of the philosophy at the core of the Gary Plan.

## **VIII : How the Gary Plan Changed the Game**

The most salient changes occurred in the classroom. Class size was increased. Labour

costs (i.e. teachers) were kept to a minimum, so there were fewer teachers. Classes were organized by age, so that all students in one class were born in the same year. This was a major departure from the system where students of many ages often sat together in one room with older students helping to teach the younger ones. Also, the school day was lengthened to mimic that of the factory worker and there was an increased emphasis on punctuality. As Bobbitt wrote in *The Elimination of Waste in Education*: "... still the educational engineer is not yet satisfied with the percentage of efficiency attained. The six hour day is not enough. The plant might well be operated continuously from eight o'clock in the morning until six o'clock in the evening." (p. 263) Teachers were also expected to come to work on weekends, although not every weekend. The reasoning, again, was efficiency: "That an expensive plant should lie idle during all of Saturday and Sunday while 'street and alley time' is undoing the good work of the schools is a further thorn in the flesh of the clear sighted educational engineer. ... Scientific management demands that the school buildings be in use on Saturdays and Sundays." (p. 263) The classroom was never the same again.

Significant changes also occurred with regards to the teachers function within the larger picture of education. Teachers were no longer consulted or involved in school administration issues. Decision making lay in the hands of the school administrators, usually from the business community, and they were not actually present in the school 'plant'. Callahan (1962) describes the changes to the concept of the teacher somewhat tongue in cheek when he writes: "Doubtless many educators who had devoted years of study and thought to the aims and purposes of education were surprised to learn that they had misunderstood their function. They were to be mechanics, not philosophers." (p. 173) The teacher had to a large extent been disenfranchised from the educational experience of his/her students and had become something akin to a low level manager in a factory.

Perhaps the longest lasting effect was in the organization of school administration. Business usually has a hierarchical power structure. The introduction of business efficiency systems into the school system through the school board brought with it the same hierarchical power structure paradigm. School boards, which were composed primarily of steel, auto and banking executives, demanded that the school system be accountable to them. This accountability paradigm is still evident today, where the business community can dictate changes in the school system on the basis of financial concerns and accountability.

The most critical change occurred in how students were perceived. This is the core of the criticism of scientific management: the student became the product of a manufacturing process and the quality of the experience of education became immaterial. The concern

was to eliminate waste, and turn the raw material into the finished product. As directly, and famously, stated by Bobbitt (1912): “Work up the raw material into that finished product for which it is best adapted.” (p. 11) To do this it was necessary to test the students to see what sort of intelligence they had, and what they would be capable of doing. It was a great waste of efficiency to place a student with low potential in a class with difficult subject matter. The student was to be ‘manufactured’. The student began school life with an ability assessment and finished with a test to see whether the prescribed goals had been reached. Cubberly’s system of testing for quality control and Thorndike’s belief in stimulus response bonds as the basis of education led to a plethora of tests and the pigeon-holing of students. Thayer (1970), in a criticism of scientific management and platoon schools writes: “The significance of intelligence tests loomed large as a means of determining in advance of a child’s education 1.) the potentialities and limitations of his original makeup and 2.) the program of education best suited for him.” (p. 72) The ultimate effect of this approach was that students lost their individual identities and became the products of an industrial, educational complex for an industrial, scientific age.

## Ⅸ : Evaluation of Scientific Management and the Gary Plan

To thoroughly evaluate scientific management one must start with the positive contribution it made to education in the USA. Obviously, it enabled the system to educate the growing student population. Also, it moved education away from Latin and the classics and towards more useful and relevant subject matter. These were important steps toward creating an egalitarian and democratic society. Further, scientific management insisted on the education of girls as well as boys, although the content of the curriculum was significantly different. The mass education of girls is a great achievement. However, there are also a number of criticisms.

The disadvantages can be seen as responses to the four philosophical dichotomies outlined earlier in Schubert’s (1986) *Curriculum: Perspective, Paradigm, and Possibility*. First, regarding society and the individual, scientific management clearly focused on the needs of society and to a large extent did not take individuality into account. There was little or no individual instruction or choice. Creativity, critical thinking, and intellectual growth were not part of the equation.

Second, with regards to power, scientific management was hierarchical rather than democratic. This disenfranchised the students, and the teachers, from the educational process, making them automated cogs in a much larger wheel. It had the effect of disenfranchising the teacher from the students’ educational experience. Ultimately, this power relationship hindered

the student's ability to address larger socio-cultural issues. It is deeply ironic that a system that set out with democracy as its goal became so undemocratic.

Third, regarding a focus on outcomes or the quality of the educational experience, scientific management clearly and without apology was centred on the product, not the process. The emphasis on outcome forced an emphasis on skills rather than their applications or interpretations that left students feeling isolated and disconnected from their newly industrialized world. As Stoughton (1981) writes in a critique of the scientific management system: "The scientific approach lacks the tools to explain the relationship between the process and the product of education." (p. 70) This shift away from the process and experience of education was a major shift away from the progressive movement and the philosophy of John Dewey. Dewey's seminal work, *Experience and Education* (1938) is in part a response to this divergence:

How many students . . . were rendered callous to ideas, and how many lost the impetus to learn because of the way in which learning was experienced by them? How many acquired special skills by means of automatic drill so that their power of judgement and capacity to act intelligently in new situations was limited? How many came to associate the learning process with ennui and boredom? How many found what they did learn so foreign to the situations of life outside the school as to give them no power or control over the latter? (p. 27)

Dewey supported many of the aims of the Gary Plan, but not the method used to achieve them, especially the way scientific management ignored the experiential nature of education.

The fourth philosophical dichotomy is the interpretation of knowledge as the accumulation of discrete units (facts or skills) or as a synthesis of ideas and concepts. Scientific management clearly comes down on the side of discrete units. One problem the scientific curriculum encountered with this approach was that it was impossible to isolate and identify all of the discrete stimulus-response bonds required by society, therefore, the goals of education were unachievable and frustrating for both the student and the teacher. This also ignored higher level thinking needed for decision making in unforeseen circumstances. On a political note, this system emphasised the distinction between production and consumption, turning out workers who would be good consumers and good workers, but would not be fit for much else. It diminished the students' ability to think critically about their society. Tanner writes "scientific management divided educational objectives into two categories, production and consumption (the ability to do and the ability to appreciate)." (p. 189) This exacerbated the dialectic which is fundamental to the distinction between those in power and those not. In simple terms, it

helped those who were in power to stay in power, and it diminished the chances of those who were out of power to ever achieve it. In this way, scientific curriculum became the antithesis of the democratic, synthesized, and empowering curriculum that had been advocated by John Dewey at the Chicago University.

Schubert (1986) has created a simple yet useful interrogation of differing educational systems and the values they represent by asking three simple questions of any education system: "1. What knowledge is most worthwhile? 2. Why is it worthwhile? 3. How is it acquired or created?" (pp 1-4) I will extend this list with three more questions about where, when, and for whom the learning is appropriate. According to the scientific curriculum, what knowledge is most worthwhile? All of the stimulus-response bonds that would be needed as an adult. Why is it worthwhile? To make the individual and society more efficient. How is it acquired or created? Through repetitive conditioning, where the teacher helps direct the student to give the desired response. Where does this learning take place? In classrooms divided by age with 30 - 40 students in large factory-like plants. When does this learning take place? From 9 a.m. to 5 p.m. every week day and, if possible, on weekends. For whom is this learning appropriate? Children will be tested and evaluated, and an appropriate course of study chosen for each student based on their abilities and the needs of the business community. These may not, in fact, be the best possible answers to these questions.

## **X : Conclusion**

Scientific management was a response to a difficult demographic situation and reflects the intellectual environment of that era. It combined elements of the progressive thinking of Dewey with Thorndike's stimulus responsive theory. It took advantage of the business communities expertise at running factories to create efficient school plants. It brought in standardized testing for schools, teachers, and students. It streamed students by age and ability, and it departmentalized education in a way that had never been done before. These were radical departures from the past that required great certainty about the benefits of such great change.

The Gary Plan and scientific management have had a lasting effect on education. Some of these are: one, the division of education into age levels; two, the direct involvement of the business community in education; three, the use of testing to stream students, standardize education, and evaluate teachers; four, the hierarchical arrangement of power structures in school administration and classroom management; five the inclusion of curricular subject areas are that are reflective of industrial and business concerns; six, the concept that school life



functions primarily to equip the student for life as an adult rather than as a valuable experience in and of itself; and finally, the belief that universal education is the best avenue to creating an egalitarian and democratic society.

Ultimately, platoon schools failed because of the disenfranchisement of the teachers and the dehumanizing effect it had on the students. Ironically, considering the emphasis on efficiency, it also turned out to be quite costly. The question for us in this era is whether we can learn from the mistakes of the past and move forwards towards a new and better educational paradigm that empowers teachers and emphasizes the quality of the experience of education for the students, or repeat past mistakes and failed attempts. Hopefully, by understanding the forces that shaped the development of scientific management and the Gary Plan, and by understanding the intellectual foundations of this movement, we can come some way to doing the former.

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教育の科学的管理とギャリー・プラン

— 簡潔な歴史と分析 —

ケンレイ フリーゼン

要 旨

教育に対する科学的な管理は1900年代初期、米国において民主化への呼応として始まった。その結果、当時の有識者によってギャリー・プランが開発された。それは平等かつ普遍的な教育システムが民主主義にとって必要なものであり、またそれは可能な限り効率的なものであるとされ、米国に台頭してきた生産工場を模倣するものであった。その延長線上には、教育の質を統制するために作成されたクーバリーの共通テストの元となったソーンダイクの刺激—反応の条件付理論がある。本論文では教育の科学的管理とギャリー・プランについて述べ、その効果を分析、評価する。

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