Clay:

Yesterday I recieved a copy of the CB #303.

I had never seen it! We moved so fast in those days (as we still do!) that you guys never got around to sending me a copy - and, I never got around to asking.

What were the revisions? Any more than your appendix A?

The Is sheets are the clearest and closest to what I originally designed that I have ever seen made by others than myself! Eric and especially Harold later shortened and changed them and put everything in the Program cell.

The only detail that is slightly incorrect is what I had as <Programmed Event> lost the past tense verb and became <Program Event> in your version.

Did you ever follow up with the effects and make a <Did> sheet to show what happened and how the components worked?began calling it the Is-Does sheet, overlooking the fact that <Is> was one sheet - what the components are, and <Does> was a second sheet - telling what the components did if anything. So with both acceleration and deceleration and <Id> and <Does> there were four sheets in full detail.

People began using <Does> for things that haven't been shown to have happened yet. So that is when I switched from <Does> to <Did> using the past tense to make it harder for them to lie about whether they had actually shown the effects on that particular student yet.

Well, so it went.

I have added the reference to my list with you and eric as joint authors and (revised) at the end of the title and the date 1969.

Are you getting up to Priest lake this summer?

Thanks again!

Ever, Og
DIRECT MEASUREMENT AND
PROSTHESIS OF RETARDED
BEHAVIOR

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DIRECT MEASUREMENT AND PROSTHESIS OF RETARDED BEHAVIOR

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Revised January 1969 by
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Children are not retarded. Only their behavior in average environments is sometimes retarded. In fact, it is modern science's ability to design suitable environments for these children that is retarded. We design environments to maintain life, but not to maintain dignified behavior. The purpose of this paper is to suggest techniques of designing prosthetic environments for maximizing the behavioral efficiency of exceptional children who show deficits when forced to behave in average environments. These suggestions evolved from the methods and discoveries of free-operant conditioning.

To design a suitable environment for the behavior of a given individual, it is necessary to specify the individual's behavioral potential in the most precise, detailed terms possible. Direct recording means (automatically) measuring a time sample of behavior in a controlled and specified environment. With direct measurement, no problems of observer bias or test validity occur; everyone admits that the behavior of concern has been directly recorded. Questions still remain concerning the reliability of the recording, the adequacy of the sample duration, and interaction between the recording system and the behavior being sampled. However, these questions can be adequately answered by manipulating variables within the behavior laboratory and by the accuracy of prediction.

Even behavioral processes which do not directly act upon some aspect of the environment or do not consist of a specified movement can be made available for relatively direct measurement. An easily recorded, arbitrary movement such as lever-pressing can be inserted between the individual and that aspect of the environment he is attending to. We call this "externalizing the behavior." It is useful if the externalizing response has minimal behavioral effects of its own (e.g., fatigue, satiation, natural consequences).

Similia Similibus Curantur--A Fallacy

In the early days of environmental therapy (viz.: psychotherapy; group, milieu, and occupa-
ational therapy), although there were few objec-
tive data, therapists argued for their procedures
with poor but highly successful logic. They sug-
gested that the cause or nature of the deficits
was similar to the type of therapy. Psychothera-
pists argued strongly for environmental causation
of mental illness in order to justify their envi-
ronmental treatments. Neurologists, biochemists,
and pathologists argued strongly for organic
causation of behavioral disorders in order to
justify their organic treatments. This primitive
homeopathic argument that "like is cured by like," once widely accepted in medicine, has been proven
false for physiological disease.

Homeopathic psychiatry, however, is still
maintained by many therapeutic partisans as they
suggest their cures for behavioral disorders.
This fallacious argument placed the individual
with retarded behavior at the bottom of the list
of environmental treatment, since the case was
strong that his behavioral deficits were organi-
cally caused.

Just as homeopathic organic medicine was dis-
proved in the first half of the twentieth century,
so will homeopathic behavioral medicine be dis-
proved in the second half. Recent research has
suggested that patients with organic myoclonus
respond more rapidly to environmental conse-
quence for not ticing than do patients with tics
of neurotic origin (Barrett, 1962). Our own
research has shown less intermittency of beha-
vioral emission (implying less attention disorder)
in retarded adults and children than in psychotic
individuals (Lindsley, 1958, 1960, 1962). Others
have suggested that organic etiology is no indi-
cation that a disorder will not respond to environ-
mental therapy (Zubin, 1963). This may be because
environmentally caused behavioral disorders involve
the major portion of the behaving system of the
individual and the input channels are thus
"jammed" by psychotic symptoms. Symptoms appear
to dominate a psychotic person's behavior and are
stronger than most discriminative stimuli and con-
sequences that the environmental engineer can
produce. Someone who is busy being sick is much
harder to stimulate than someone who is born with
a limited behavioral repertoire. Environmental
treatment may prove to be the treatment of choice
for retarded behavior, even when of organic
origin.

Deficiency-Produced Specific Superiority

Environmental prosthesis might not only neu-
tralize the deficits of the behaviorally handi-
capped but might even give them behavioral adven-
tages in specific skills or in specific environ-
ments. We have found, for example, that retarded
children often learn simple discriminations faster
than normal children (Lindsley, 1958; Barrett and
Lindsley, 1962). Some retarded children have also
shown considerable artistic talent. These superior
skills in behaviorally handicapped persons are
illustrated and interpreted in detail elsewhere
(Lindsley, 1965). The popular notion that
superior skills in both behaviorally and physio-
logically handicapped persons are due to motiva-
tional compensation (they work harder since they
have farther to go) is challenged. Four simpler
interpretations of deficiency produced superiority
are offered: (1) less response competition; (2) easier career choice; (3) lowered thresholds; and (4) less behavior to decrease or decelerate.

I stress the possibility of behavior deficits resulting in specific advantage in certain prosthetic environments to show that the prosthetic goal can be higher-than-average performance. We can make specific superior productivity the goal. Society may not only manage its retarded individuals with full efficiency and dignity, but in special cases reap profits not attainable from more generally skilled persons.

Three Prosthetic Strategies

Three basic strategies have been successfully used in prosthetizing and rehabilitating the behaviorally handicapped: (1) construction of prosthetic devices; (2) prosthetic training; and (3) construction of prosthetic environments.

Prosthetic devices are worn or carried about by the handicapped person. They permit him to behave normally in an average environment. Some of these devices amplify the intensity or pattern of stimuli. Eyeglasses and hearing aids are well known. Other devices, such as braces, crutches, artificial limbs, wheel chairs, and dentures, serve to strengthen or replace an individual's movements or responses. Even cosmetics are prosthetic devices, as they serve to reduce the avoidance responses of others. Well-known prosthetic cosmetics include makeup, hair dyes, wigs, and girdles. Prosthetic devices also include instruments of wide application to relatively minor behavioral deficits—for example, notebooks, appointment books, watches, slide rules, and computers. In effect, almost all the tools of man are prosthetic devices. What we need are special tools for the use of those unfortunate people who have relatively uncommon behavioral deficits. Since their deficits are exceptional, tools have not been developed to facilitate and support their behavior.

Specialized prosthetic training can be given to persons with certain behavioral handicaps to permit them to behave efficiently in average environments. It may be possible to lower sensory thresholds by training. Sensory deficits are more commonly treated by prosthetic training in receptor substitution. The best known of these techniques are lip reading and piano-feeling for the totally deaf and cane-tapping for the blind.

Physical rehabilitators spend most of their time on effector substitution. Individuals are trained to use non-debilitated muscles to perform tasks which were previously accomplished by the injured or destroyed muscles. Those of us who grew up in the days before the Salk vaccine can remember the unusual and ingenious ways in which polio victims learned to substitute non-diseased muscle systems for performing routine daily activities. For people with poor memories, training in the use of mnemonic devices and memory systems is well known.

Prosthetic environments are much more common than most of us realize. Stimulus substitution techniques which are in common use include Braille books and magazines for the blind, bells which ring for the blind when the "walk" light is on at traffic intersections, and standardized traffic
light position and intensity for the color-blind. Common effector substitutes are ramps, elevators, and handrails for those with walking disabilities and specially designed homes and automobiles for paraplegics. The physiologically handicapped are actually behaviorally handicapped with deficits limited to effector or receptor function. However, higher-order forms of behavioral handicaps exist. Examples are discrimination and differentiation deficits, contingency and consequence deficits, and reflex integration disorders. These higher-order deficits are now lumped under the categories of mental retardation, brain damage, or psychosis.

Although prosthetic devices and training have the advantage of permitting a behaviorally handicapped individual to function within an average environment, their design usually requires detailed knowledge of the variables controlling the deficits. Since at this stage we cannot precisely describe higher-order behavioral deficits, the most practical immediate strategy would be to design prosthetic environments in which the deficient behavior is not needed, rather than attempting to provide prosthetic devices and training.

**Acquisition vs. Maintenance Prosthesis**

There is a great tendency today to confuse the acquisition of behavior with its maintenance. In fact, quite a different set of conditions is required to teach or initiate a behavior than is required to maintain the same behavior. Prior to the discovery of intermittent consecuation (Ferster and Skinner, 1957), psychologists believed that every response had to be consecuated in order to maintain responding. Ferster and Skinner showed that even though it was necessary to consecuate almost every response in order to "shape" or generate a particular response, the proportion of responses consecuated could be rapidly reduced until the ratio of response to payoff was so high that organisms expended more energy in responding than they received in calories of food consecuation. This surprising contradiction of behavioral homeostasis clearly demonstrates that the conditions necessary for acquiring behavior are different from those necessary for maintaining the same behavior.

Special educators, vocational rehabilitators, social workers, attendants, psychologists, and psychiatrists often maintain behavior with procedures which were only necessary for its acquisition. This happens because clinicians are strongly consecuated for helping debilitated individuals. It is accelerating to them to be needed by a handicapped person and possibly decelerating for some to be shown that they are no longer necessary.

The only way to insure that acquisition procedures are not inefficiently and unnecessarily used after the behavior is acquired is to remove them gradually. If the behavior breaks down, then the procedures should be put back until the behavior returns. As prosthetic techniques are removed, sensitive calibration of slight reductions
in performance is necessary in order to prevent superstitious use of the techniques to maintain the behavior. Therefore, accurate and detailed direct records of behavioral deficits must be routinely made to insure that maximally efficient prosthesis is maintained.

The difference between acquisition prosthesis and maintenance prosthesis cannot be overemphasized. It is almost as unkind to needlessly "crutch-trap" a handicapped person as it is to deny him a crutch in the first place. It is equally indecent to make a perpetual behavioral cripple out of an individual who only required a slight push over an acquisition "hump"—most especially when another patient goes without needed attention. We must convince those engaging in behavioral prosthesis that acquisition prosthesis is more valuable and skillful than maintenance prosthesis. Only in this way will educators, rehabilitators, and clinicians be more consequated for vanishing themselves and their techniques as soon as possible. Then the educators may move freely to a new patient who needs him more for acquisition prosthesis than his old patient needs him for maintenance.

Free-Operant Conditioning

In free-operant conditioning the rate of a chosen performance is altered by arranging suitable consequences (arranged events). This procedure contrasts with Pavlovian conditioning in which behavior is manipulated by altering its antecedents. Free-operant conditioning has the advantage of dealing with emitted or "volitional" behavior which often appears to have no antecedents and is of wide social concern. Since the individual being conditioned is at all times free to emit any response, the method interacts minimally with the behavior being studied. Environmental isolation of the individual within an appropriate enclosure permits the behavioral scientist to control experimentally—rather than statistically—all environmental events which might affect the behavior he is studying. This high environmental control and automatic, direct, continuous recording qualify the method for inclusion in laboratory natural science. The history of free-operant conditioning (Skinner, 1959), its techniques (Ferster and Skinner, 1957), tactics (Sidman, 1960), wide social potential (Skinner, 1956), and successful applications in human psychopathology (Lindsay, 1960) and human social behavior (Cohen, 1962; Linkley, 1963a) can only be referenced here.

Free-operant methods are especially suited to prosthetics for the behaviorally retarded for several reasons. Focus on motivational aspects or consequences in the immediate environment permits direct application of laboratory results to
classroom and ward situations. Direct recording of the temporal distribution of behavior provides records of the attention fluctuations and seizures which are so common in retarded behavior. The sensitivity of the method to subtle changes in individual rate, efficiency, and interaction patterns permits the study of single individuals. Since these methodological advantages do not decrease with very long periods of application on the same individual, reliable longitudinal studies are possible. The highly significant experimental project histories generated by the method are ideal for comparison with individual clinical and social histories. The recently developed techniques of conjugate consequence and closed-circuit-televized social stimuli permit direct recording of dynamic interpersonal relationships of high clinical relevance (Nathan, Schneller, and Lindsley 1964).

Free-operant principles, methods, and terms may provide special educators with (1) a fresh theoretical approach; (2) laboratory description, prognosis, and evaluation; (3) individualized prosthetic prescriptions; and (4) designs for prosthetic environments.

**A Fresh Theoretical Approach**

Free-operant conditioning principles and terms can provide a practical tool for helping special educators and vocational rehabilitators to increase the efficiency of their education, training, and management of retarded behavior. In this new approach the educator or rehabilitator does not assume the role of playmate, custodian, policeman, or even sophisticated clinician. Instead, his role is that of a specialist in retarded behavior. He arranges the classroom, home, or institutional environment so that the children can play with each other and maintain their own personal dignity and deportment. The retarded-behavior specialist may turn over some problems to clinical experts trained to deal with them. The clinical experts can in turn do their job better since the retardation specialist can give a precise behavioral description of the problem.

The current training, motivation, and philosophy of special educators and vocational rehabilitators are ideal for operant prosthetic methods. Their concern is with the children and their behavior. Their interests are practical, and their needs immediate and direct.

Most important in the practical application of free-operant principles are: (1) precise behavioral description; (2) functional definition of stimulus, response, and consequence; and (3) attention to behavioral processes.

**Precise behavioral description** facilitates communication between the teacher or rehabilitation counselor who is in direct contact with the retarded behavior and consulting behavioral and clinical specialists. Behavioral description not only focuses attention on the actual behavioral movement which is emitted at either too high or too low a rate, but also permits counting the frequency of the response and directly accelerating or decelerating it with suitable consequences. Accurate records of the frequency of response emission under different environmental conditions are absolutely
necessary prior to developing efficient applied behavioral prosthetics. The prosthesis can be no more accurate than the descriptions of the target deficit and behavioral goal.

**Functional definition of stimulus, response, and consequence** focuses the attention of the special educator on the relationship between the behavior he is attempting to produce and his educational procedures. When the teacher realizes that what is rewarding (accelerating) to one child may be punishing (decelerating) to another and that a child may be so starved for human attention that a scolding serves as a reward, he has accepted the full complexity of human behavior and will no longer make gross errors in behavioral management based upon misguided empathy.

**Attention to behavioral processes** is extremely important for intelligent behavioral management. The processes of acceleration, deceleration, satiation, fatigue, response competition, and response differentiation are important alternatives which should be tried before the educator gives up on teaching a specific performance. There are numerous citations of successful use of these processes in eliminating extremely bizarre behavior. A good example is an application by Ayllon (1963a). He instructed nurses to satiate a towel hoarder by filling her room with towels. When the number of towels in her room reached 625, the psychotic patient discarded them with vigor! She continued to discard towels until the number in her room averaged 1.5 compared to the previous 20 towels she hoarded. This example is given to stress the importance of trying all the available behavioral processes before one gives up on managing a behavior disorder. There may be many ways to manage a specific behavior.

Important for generating and maintaining maximal behavior in a classroom or ward is the establishment of a learned general accelerated consequence or token. This token must be used to purchase all things of importance to the students. Opportunities for play, recess, speaking to the teacher and to each other, sitting in "choice" seats, wearing a scarf of brilliant color, being first in line, and so forth, are highly consequating events which are usually so delayed that they are wasted. Recent research has proven that consequences must be practically immediate in order to be effective. In fact, some teachers even inadvertently use these powerful social consequences to accelerate inappropriate behavior, for example, by letting the bully always be first in line. If classroom tokens must be used to purchase the opportunity to perform desired behaviors, the teacher can then immediately deliver the tokens for educational and social progress. Ayllon (1963b) has taught psychiatric aides to use ward tokens in this way in training chronic psychiatric patients to care for themselves and their ward.

**Operant Behavioral Equation**

In training special educators, vocational rehabilitators, and attendants to approach behavioral deficits operantly, I have found it useful to stress the five-component operant behavioral equation. The components of a single operant
reflex (or behavior unit) are, in order, disposition (D); stimulus (S); response (R); contingency (K); and consequence (C).

In diagramming the analysis of behavior, we use capital letters as the symbols for each component and separate them by dashes:

D - S - R - K - C

disposition stimulus response contingency consequence

If the emission rate of the response is increased by the consequence contingent upon it, then the consequence accelerates and we mark it AC. If the emission rate is decreased by the consequence, it is a decelerating consequence, notated by DC.

In analyzing a deficient operant to determine which component may be causing the deficiency, each component must be independently tested for operant function on each individual. We have given another set of names to events whose operant function is still unproven, to clearly separate them from components with proven, non-deficient function. These terms are program (P); program event (PE); movement cycle (M); arrangement (A); and arranged event (AE). They are diagrammed as follows:

P - PE - M - A - AE

program program movement arrangement arranged

An example will show how this notation system helps determine which component of a deficient operant is not functioning. A psychologist has tested a child’s discrimination behavior. If the child operated a plunger on a wall when a light was on, every tenth pull produced a piece of candy. The child pulled the plunger and got some candy, but he pulled when the light was off as much as when it was on. What can the psychologist say, except that the child could not learn to pull only when the light was on? The psychologist can say nothing more than this without further experimental knowledge of the behavior of that particular child. The operant equation now reads:

P₁ - PE₁ - M₁ - A₁ - AE₁

experiment light plunger pull 10:1 candy

Any one or more of the five operant components could be deficient. An operant equation with five unknown components cannot be solved for one unknown.

A prosthetically oriented psychologist would not assume that the child has a visual discrimination deficit. Nor would he try other arranged events. Nor would he manipulate the contingency arrangement. Instead, he alters the response component, because he had noticed when he looked into the room that the child's plunger pulling seemed "rhythmic" or "mechanical." The psychologist

*This equation is now called IS-DOES. The IS section (P-PE-M-A-AE) describes components, while DOES (D-S-R-K-C) reports an effective or functional relationship. (E.H.)
substitutes jumping-on-a-pedal for pulling-the-plunger as the movement component:

\[ P_1 \rightarrow PE_1 \rightarrow M_2 \rightarrow A_1 \rightarrow AE_1 \]

experiment light jump 10:1 candy

10'

The child only jumps for candy when the light is on! The psychologist has now discovered four operant components and can assign operant functions to the components in his equation:

\[ D_1 \rightarrow S_1 \rightarrow R_2 \rightarrow K_1 \rightarrow AC_1 \]

experiment light jump 10:1 candy

10'

The child has visual discrimination ability, has jumping as an operant response, has 10:1 as an operant contingency, or constant ratio 10, and is consequated by candy. The child has a response function deficit, probably involving the hands, but does not have restricted manual movement.

The psychologist can now use four of the demonstrated operant components to find out if the child will work for tokens:

\[ D \rightarrow S_1 \rightarrow R_2 \rightarrow K_1 \rightarrow AC_2 \]

experiment light jump 10:1 token

10'

This operant equation, containing four components with known function, can be solved for the unknown consequence (token) being tested. In other words, in order to pin down an operant deficit to one of its components, we must have only one unknown in the behavior equation we are trying to solve.

**Operant Component Building**

In some cases of extreme behavioral deficit we cannot locate appropriate operant components with which to generate a required operant reflex. Sometimes these cases can be prosthethized by prosthetic training by building the missing components.

Stimulus building techniques give to neutral environmental events the ability to elicit responses, i.e., stimulus function. If a different event which is a strong stimulus can be located, then the neutral event can be presented with the stimulus until it comes to elicit its own response by the classical conditioning process.

The possibility of using decelerating stimuli to give neutral events stimulating function should not be overlooked. Circus trainers and early educators used this technique for extremely difficult stimulus building and found that only a few paired presentations were necessary. Since modern educational and conditioning techniques are so efficient with individuals of average and general ability, the use of decelerating stimuli to classically condition stimulus function has been forgotten. It may prove to be irreplaceable in prosthethizing restricted but severe behavioral deficits in stimulus function.

Stimulus building should not be confused with stimulus shaping, or fading, which is well known to those working in programmed instruction. In stimulus shaping, some dimension of a neutral event is altered to the point at which it can serve as a discriminative stimulus for an existing intact operant reflex. Not only must all components of

*All behavior is reflexive, some is under antecedent control (such as Pavlov's work) or subsequent control or both as in most educational settings. (E.H.)
an operant reflex--response, contingency, and consequence--be available, but the individual must also be capable of discrimination. Responding only in the presence of the stimulus is accelerated. Then the dimension that was altered is gradually returned to the point that was previously non-stimulating, while the consequence is still contingent on responding only in the presence of the stimulus. The result of fading the stimulus is a sharpened discrimination, with previously neutral points on the dimension now functioning as stimuli.

Thus, in stimulus shaping, an event which cannot serve as a discriminative stimulus is given discriminative function by gradual modification of a stimulus dimension of an existing operant reflex. In stimulus building, an event which does not stimulate is made to do so without requiring an intact operant reflex.

Response building includes procedures whereby movements which cannot serve as responses in an operant reflex are given response function by special training. Although these procedures often puzzle academically trained psychologists, they are commonplace to empirically trained rehabilitators. Even a normal individual finds it hard to bring small discrete bands of muscle under operant control. However, if he practices in front of a mirror, he can use the visual feedback to build the response; and after a certain amount of such training, he no longer needs the mirror. External manipulation of limbs by physical rehabilitators, until the patient can eventually move the limb by himself, is an example of response building. The flight instructor's manipulation of the student pilot's hands and feet by the training joystick and rudder pedals which are linked to his own is another example.

Consider the often puzzling case of negative practice (Dunlap, 1932). A movement emitted at a moderately high rate fails to decelerate when all accelerating consequences are removed. We wish to decrease its emission rate. By accelerating the movement which we wish eventually to eliminate, we increase its rate and build it into an operant response. Now, after we have built the movement into an operant response, we can inconsequeate or extinguish it. We remove the accelerating consequence, and the rate drops to a value far below undifferentiated movement emission rate.

Response building is not the same as response shaping, which is well known to experimental psychologists. In response shaping, an individual with an intact operant reflex is taught to produce a related, but more complex response. The consequential contingency is gradually shifted to neighboring responses of slightly more complex topography, while the accelerating consequences are delivered often enough to keep the individual responding. In this way, extremely complex response patterns can be shaped without verbal instruction.

Thus, in response shaping, a movement which is not emitted is produced by gradual modification of the response topography of an existing operant reflex. In response building, a movement which is regularly emitted but cannot serve as part of an operant reflex is given operant response function.
Contingency building is well known by operant conditioners. The number of responses to each consequence is gradually increased until the individual is responding on a contingency with a high degree of intermittency which would not have supported his behavior initially (Ferster and Skinner, 1957).

Consequence building is also well known by psychologists. Neutral events can be made into accelerating consequences by pairing them with highly effective accelerated consequences. Also, neutral events can sometimes be made into accelerating consequences by depriving the individual of them for long periods.

Stimulus building and response building are seldom considered by psychologists but are often the stock-in-trade of educators and rehabilitators. Contingency building and consequence building are little known among rehabilitators but are subjects of refined laboratory study by psychologists. By putting together the information and techniques of special educators, rehabilitators, and psychologists with a uniform and precise notation system, we can cover the whole range of operant component building.

Laboratory Description, Prognosis, and Evaluation

Free-operant conditioning methods can be used to develop behavior research laboratories for directly measuring human behavioral deficits. The first such laboratory was established by us at Metropolitan State Hospital in 1953. The most recent was established by Dr. Beatrice Barrett at Walter E. Fernald State School in 1963. Altogether there are over ten laboratories in daily operation; four of these specialize in recording deficits in retarded behavior (Orlando and Bijou, 1960; Ellis, Barnett, and Pryer, 1960; Spradlin, 1962; and Barrett, 1963). Over 30 of these laboratories operate intermittently, due to the irregularity of thesis research and graduate assistance.

In brief, these laboratories consist of several small experimental rooms which provide controlled environments in which behavior deficits are automatically recorded. Subjects are brought to a room by an aide and permitted to behave freely for a period long enough to measure the presence and degree of certain behavioral deficits. The experimental rooms differ from each other only in the equipment necessary to manage different behavioral deficits. Three rooms equipped to record very different behavioral deficits in our own laboratory are described below as examples of the make-up of these laboratories.

We have designed an experimental enclosure and apparatus for generating operant responding in human infants as young as five months of age (Lindsley, 1963a). The infant lies in a small bassinet with his feet against a large panel which can be depressed about one-half inch. Each depression of the panel briefly increases the intensity of a lamp in a movie projector, permitting the infant to see the movie. Rapid pressing of the panel makes the projected image grow brighter and brighter, directly relating the rate of panel-pushing to the intensity of the movie. These contingencies externalize the looking behavior
of the infant and make the panel-pushing response a looking response. In this way continuously changing narrations can be used to maintain the behavior of extremely young infants at high, even rates. In previous research using brief episodes of music, sound, colored lights, and projected slides as accelerating consequences, infants behaved in irregular bursts of 5 to 30 responses. We feel that it is the use of conjugate consequences together with a large response panel which does not require discrete movements for operation, which permits generating steady, rapid responding in such young infants.

This apparatus can be used to measure the infant's interest in different filmed, televised, or closed-circuit-televised narrative social arranged events (such as his mother's smile as compared with his father's). It can also be used to generate behavior for laboratory testing of discrimination, differentiation, and learning ability to different classes of stimuli. Signs of retarded behavior may be picked up in the first few months of life with such equipment. Then, individualized prosthetic techniques could be prescribed and perhaps the development of marked retardation arrested.

By designing stimuli (vibrations or sounds) which can enter the uterus and by using delicate electrical movement transducers which can record movements of the fetus within the uterus, we might be able to operantly condition fetus behavior. We could then directly measure the rate of development of fetal behavior. It is even possible that we could determine individual differences in discrimination ability and thus predict retardation prior to birth. All that this requires is slight modification of devices and techniques which are already available and proven.

In another room, we can directly and continuously record the interaction between plunger-pulling conseuated by small objects (candy, coins, toys, or tokens) and symptomatic hypermobile pacing in children and adults. With this device, we found that the majority of chronic psychotic patients are most able to manipulate the immediate environment for consequences at the times when they are also pacing—a result that surprised us very much. This apparatus, with an additional channel which records the rate of vocalizing through a hidden microphone, is currently used to evaluate simultaneously the effects of psychotherapeutic drugs on symptomatic pacing and vocalizing and adjutent manual responding of psychotic and retarded individuals. By continuously recording an individual's output of these three behaviors throughout a seven-hour experimental session, we can directly analyze interaction among them. Patients willingly work for seven hours within our experimental rooms if consequences are adequate.

Recent results suggest that children show fatigue during the last three hours of these seven-hour sessions whereas adults do not. Retarded children, when fatigued, begin to emit all three behaviors at once, spending brief periods of time doing nothing. This pattern is also found in a large number of psychotic patients—but throughout the session. Normal children, on
the other hand, show something more like boredom; in the last three hours, their manual responding is not interrupted, but they pace for brief periods (Lindsley, 1964b). Direct recording of simultaneously emitted reflexes promises to shed light on higher-order behavioral processes which have previously been beyond the scope of direct laboratory measurement. The interaction between the integration of separate reflexes should tell us much about higher-order behavioral deficits and the possibilities for prosthetizing them.

In the third experimental room, we simultaneously record discrimination, differentiation, and excessive inefficient generalization in both children and adults. The protege sits comfortably in front of a wall-mounted panel, on which are two lights with a plunger under each. A small object (candy, coin, token or toy) drops into a receiving bin in the panel for every tenth pull of the left plunger only when the left light is on. If the protege learns to pull the left plunger only, regardless of which light is on, he has learned to differentiate or tell the plungers apart. If he learns to pull both plungers when the left light is on and pulls neither when the right light is on, he has discriminated or told the lights apart; but he has not differentiated since he is pulling both plungers. If he learns to pull only the left plunger when the left light is on and only the right plunger when the right light is on, he has both discriminated and differentiated but has excessive inefficient generalization (pulling the one under the light). This generalization is inefficient and maladaptive because pulling the right lever with the right light on has never been conseqeuated. Such excessive generalization is so strong that in certain psychotics it resists both counter-consequation and direct deceleration with mild or even strong shocks presented to the right lever.

So far we have screened the discriminative and differentiative behavior of over 140 individuals using this procedure. None of the normal adults showed deficits. Sixty percent of the normal and forty percent of the retarded children, 11 to 14 years of age, showed no deficits. Only about ten percent of the psychotic adults, senile, and psychotic children showed no deficits. These results strongly suggest that the current novel learning ability of the retarded child in a controlled environment, although below that of the normal child, is markedly superior to the current learning ability of psychotic adults and children. These laboratory data support our notion that environmental prosthesis may be more effective with retarded than with psychotic individuals.

The severe deficits in current learning ability in adult and senile psychotic patients were initially surprising, since many of these patients had large repertoires of complex individual and social behavior which they could emit in appropriate situations. The laboratory measurements proved, however, that their current discrimination abilities in a novel situation were extremely deficient. In retrospect, our findings made sense because the chronic psychotic adults in most cases had about 20 normal years during which they
acquired large and complex repertoires. The senile psychotics had an even longer time, in most cases around 60 years, in which to acquire complicated behavioral repertoires. In other words, the severe learning deficits which are a property of their psychoses did not develop until after they had acquired a wide range of complicated appropriate behavior. Clearly, appropriate emission of a complicated response is no indication that a response of equal complexity can be currently acquired. Children who have had retarded behavior and learning deficits since birth and have been in only average environments have had no opportunity to acquire complicated repertoires.

Current learning ability cannot be accurately assessed by sampling current behavioral repertoires in classrooms or wards. The current learning ability of geriatric and psychotic patients may be exaggerated by the influence of the behavioral repertoires they acquired prior to their deficiencies. The current learning ability of retarded individuals may be underestimated by casual observation since they have had opportunity to develop complicated behavioral repertoires. Faculty assessment of current learning ability in terms of current repertoire, added to the fallacy of similia similibus curantur, has erroneously placed retarded behavior at the bottom of the list of prospects for environmental treatment and re-education.

Fully automatic programming of stimuli and recording of responses in behavior laboratories insure completely objective measurement. Since technicians do not intervene between the patients and the automatically recorded data, they do not introduce complicating observer bias. Longitudinal studies are not disrupted or complicated when technicians are changed. Cross-hospital and cross-cultural comparisons are possible since language is not necessarily involved in the behavioral measurement. The opportunity to dispense with verbal instructions permits analysis of non-verbal patients.

Laboratory measures of the behavioral deficits of each individual patient should be included in the patient's case history and should be regularly used to evaluate the effects of therapeutic variables. The effects of medication and of such social variables as teacher and ward reassignment, home visits, and hospital events can be easily determined. In this way, detrimental treatments can be rapidly terminated before such damage is done to the patient. Individualized behavioral treatment can then be conducted with the same precision with which individualized physiological treatment is now conducted in well-staffed general hospitals.

**Design of Prosthetic Environments**

Since retarded behavior is undoubtedly the result of morbid interactions between a large number of organic and environmental causes, there is little hope of totally preventing its occurrence in the near future. However, we can reduce its

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7Barrett (1963) has recently stressed the need for individualized prosthetic prescriptions based upon laboratory behavioral measurement for use in designing individually tailored programs of instruction for children with retarded behavior.
debilitation by designing environments which compensate for the specific behavioral deficits of each retarded person. Since these environments will not remove the behavioral deficits but will merely eliminate the debility caused by the deficits, they cannot be considered completely therapeutic. Therapeutic environments would generate behavior which would be later maintained when the individual was returned to a normal or average social environment. Prosthetic environments must operate continually in order to decrease the debilitation resulting from the behavioral deficit.

Weiner (1963) also has stressed this basic difference between irreversible therapeutic variables and reversible prosthetic variables and the problems this difference poses for therapeutic research design. Although I am also concerned with research design problems, I suggest that prosthetic variables have great utility in managing behavior for which we have not yet located a permanent therapy. In this section, I make suggestions for designing prosthetic environments for retarded behavior. In order to make these suggestions as accurately as possible I will use the components of Is-Does, of the operant behavioral equation described above as a classification system. The number of different types of prosthetic stimuli and programs required for prosthesis of the behavior of a given individual cannot be determined until the number, degree, and range of behavioral component deficits of that individual are accurately determined. In many cases a given prosthetic device can be used to prosthete more than one type of behavioral deficit, and often a single behavioral deficit can be prosthete by more than one device.

In these cases, the most economical and the most general devices should be selected first.

Although I cannot review the literature here, several research groups have recently shown that prosthetic or responsive environments can produce dramatically efficient behavior in culturally deprived children. Two excellent recent studies are those of Moore (1963) and Blatt, Garfunkel, Sarason, and Brabner (1964).

These suggestions for designing specific prosthetic environments for retarded individuals are certainly not exhaustive. They are only examples for the direction of future research and practice. The range and quality of prosthetic devices are limited only by the creativity of behavioral scientists, whose time, funds, and novelty of approach are in turn limited only by society's interest in providing behavioral dignity for retarded persons.

**Prosthetic Stimuli**

Environmental events which signal when a response is appropriate (i.e., it will be accelerated) and when it should not be made (i.e., it will be ignored or decelerated) are extremely important in controlling behavior. Traffic lights are a familiar example. Although many people do not realize it, different clothing styles commonly function as discriminative stimuli. The stimulus function of differently colored and designed uniforms is a matter of life and death to soldiers at war. The uniform of the policeman is designed
to elicit specific responses from the general public. Sex differentiation in clothing is also important, despite its increasing subtlety. Many responses appropriate to a person wearing a dress are not appropriate to a trousered individual. The retarded individual may have behavioral deficits which limit the range of discriminative stimuli in the average environment which can control his behavior. Stimuli to which the retarded individual can differentially behave can be added to the average environment so that his behavioral deficits will no longer limit his action.

The intensity, size, and number of discriminative stimuli for retarded behavior have received some prosthetic attention. Special educators working with retarded children often use simple and dramatic patterns, long durations, and higher intensities of stimulation than are used in educating normal children.

Multiple sense displays are not as frequently considered for stimulus prosthesis. A retarded individual might not respond appropriately to a loud sound alone or to a bright light alone, but he might respond appropriately to simultaneously presented sound and light. The more primitive tactual, vibrational, and olfactory stimuli should be considered for multiple sense displays. In a case of extremely severe retardation, it may be that no conditioned stimuli can be used, while unconditioned primitive eliciting stimuli could be used. For example, individuals who could not learn to follow a previous path or printed signs to the toilet might very well follow an odor trail by themselves. A regressed retarded individual might learn more easily to use a malodorous toilet than a floral-scented toilet designed for normals. This unpleasant procedure would be far less than its alternative—untidy bedding, class-rooms, and clothing.

Expanded narrations should be tried with children who have deficits in responding to narrations which unfold at normal rates. Melrose (1962) found that many aged persons who cannot understand normal speech can understand expanded speech. Expanded speech is merely spread out more in time and does not differ in intensity or tone from normal speech. Just as some aged persons cannot respond to information presented at the normal rate, some retarded persons might show the same deficiency. Tape recording systems could be used to expand visual materials in addition to auditory materials. By slowing down both auditory and visual channels of educational films and broadcasts we might be able to prosthetize narrative stimulus deficits. It is also possible that expanded auditory and visual narrations would have an accelerating function for some retarded individuals when the same narrations presented at the normal rate would not. (Lovitt 1966, 1967, EH).

Response-controlled discriminative stimulation should be tried as a prosthetic technique for retardates who appear to have intermittent attention or behavioral seizures. When an individual is periodically unresponsive to stimulation, the stimuli which occur during these unresponsive periods are lost to him forever. Appropriate responding is impossible because for him the world
has missing portions.

In response-controlled narration, the narration moves along only when the patient is actively responding to it. When the patient goes into an unresponsive period or behavioral seizure, the narration is stored until the patient responds again. The stimulus can be stored either by stopping the tape or film or by running a small continuous loop which repeats the last narrative event responded to. Even dynamic direct social presentations can be response-controlled. For example, a teacher who had a direct moment-to-moment index of the retarded student's attention could halt his delivery when he noticed the child was in an unresponsive episode. When the attention of the child returned and the looking and listening responses reappeared, the teacher could begin his presentation where he left off. With this technique, "dead" portions in the patient's attention would merely increase the total presentation time without removing essential portions of the narration.

Catalysis of seizures in groups of seizure-prone individuals could be conducted so that all of a special class could have their seizures in a safe place at a time when the seizures would not interfere with educational presentations. This possibility is not remote. It merely awaits the discovery of useful catalytic stimuli. Most researchers, continually searching for alleviating or therapeutic events, overlook the opportunity to discover catalytic events which induce behavioral disorders. However, Cameron (1941) placed senile patients in dark rooms and was able to catalyze or induce senile nocturnal delirium. This proved that senile nocturnal delirium was not due to end-of-the-day fatigue as had been previously supposed. Rather, the delirium was due to the darkness and reduction in stimulation which also came at the end of the day.

In our laboratory we catalyzed vocal hallucinatory episodes in some chronic schizophrenics by calling their names over speakers hidden in the experimental room. Our data suggest that catalysis of hallucinatory episodes reduces their spontaneous frequency of occurrence not only within the experimental room, but also during the rest of the day when the patients return to the wards (Lindsley, 1963b). In earlier experiments we discovered that in some patients psychotic episodes could be catalyzed by fixed-ratio consequence schedules. Their bizarre behavior appeared only during the pauses after consequation. During the time the patients were pulling plungers for candy and cigarettes, the psychotic episodes did not occur. We also have evidence that the psychotic episodes of a few patients are catalyzed when the patients are given problems they cannot solve (Lovitt, 1966).

These suggestions for catalyzing seizures and episodes of disturbed behavior at times when the patients can be well cared for and when the episodes would not interfere with educational presentations are presented as examples of the sort of prosthetic techniques which can be undertaken once we fully understand specific behavioral disturbances. We may not be able to eliminate the disturbances totally, but we could make great
progress by bringing the disturbances under environmental control and producing them when they can do no harm to the patient or his education. For example, the exercise or recess period, which many consider essential for proper management of children's behavior, may actually be serving as a prosthetic group disturbance catalyst. The excessive exuberance and motor behavior which would intermittently disrupt classrooms are catalyzed in all students at once in the school yard where they harm neither the students nor their education.

Prosthetic Response Devices

The response component of retarded operant behavior is a major problem and debilitates a large number of children. Recent research has shown that response differentiation deficits are severe in some children and greatly resist strong differential consequation (Barrett and Lindsley, 1962). However, in intelligently designed prosthetic environments which do not require fine response differentiations, this deficit could be easily bypassed.

Wide response topographies would eliminate the handicap of inaccurate finger placement and palsied movements. For example, telephones with push buttons or a voice-operated system would completely prosthetize dialing deficits. Electric typewriters with large, well-spaced keys which could be banged with the fist would prosthetize typing and writing deficits in children with extremely palsied movements. Arm-operated water faucets, of the type used on surgeons' washbasins, and doorknobs and window locks of similar design would permit children with motor deficits to manipulate their prosthetic environments efficiently. It is amazing that we have not provided such handicapped persons with more easily manipulated clothing fasteners, when some normal children with extremely skillful motor coordination take years to learn to tie their shoes, button small buttons, and operate zippers. Think of the indignity imposed upon an individual who simply cannot control his hands accurately and must have someone else button his trousers.

Rate switches which must be repeatedly pressed at a high rate could be used to prosthetize individuals with intermittent or weak attention. Even with normal individuals, foot switches which must be continually depressed by the operator have greatly reduced industrial accidents. When the operator turns away from the machine, his foot comes off the control switch and the machine automatically stops. In the same way, a higher degree of constant attention is demanded by rate switches. A switch that must be continually pressed should reduce the accident hazards to individuals with attention disorders operating dangerous machinery. If their attention drifted or a petit mal seizure occurred, they would fail to press the switch at the required rate, and the machine would automatically stop.

Response feedback systems could be used to correct response location errors before they actually occurred. For example, a capacitive sensing device at the side of a needle on a sewing machine could sound a tone louder and louder the closer the fingers came to the stitching
needle. Such feedback stimuli and consequences should greatly compensate for deficient kines- 
thetic ability and afferent input and not only prevent accidents but increase manual skill.

Response building techniques, which were previously discussed, should of course be tried. To some extent, response feedback systems may serve as prosthetic training devices for building responses from movements which previously could not serve as operant responses. We could merely reduce the intensity of a feedback tone to see if it were still required for maintaining the behavior. If it were not necessary, the feedback stimulus and consequence could be eliminated for that now therapeutized response deficit.

Prosthetic Contingencies

In social situations, when the accelerating consequences are episodes or discrete events, the consequence almost always occurs intermittently (Ferster, 1958). That is, only some responses are immediately followed by a consequating episode. Despite this, normal individuals continue to respond at high, even rates. This responding is presumably maintained by synthetic consequences from the occasionally naturally consequated responses. However, our experiments with retarded and psychotic children and adults have shown that many are unable to maintain high rates of responding on intermittently scheduled consequences, even when adequate consequences are used (Lindsley, 1960). These deficits in intermittent contingencies of consequence are probably related to deficits in recent memory and in formation of synthetic consequence.

A large portion of patients with deficits on intermittent contingencies respond at normally high rates when we use a conjugate consequence contingency, in which the intensity of a continuously available consequence is a direct function of the response rate. A conjugate contingency is analogous to the chase, whereas an episodic contingency is analogous to the hunt. On the conjugate program, some aspects of the consequence are present (though rapidly waning) during brief pauses in responding, as in the chase when a dog follows an odor trail. On episodic contingencies, all aspects of the consequence are absent during pauses in responding; and if the ratio of responses to consequence is high, many of the responses are emitted in the absence of consequence. As in the hunt, some higher-order behavioral process must be used to maintain the behavior at high strength. It seems clear to me that conjugate consequence, like the chase, requires only primitive or basic behavioral processes, and hence it is not surprising that it goes deeper into sleep, anesthesia, infancy, and psychosis than does episodic consequence (Lindsley, 1961). For these reasons conjugate consequence contingencies should be tried as prosthetic techniques for retarded behavior that shows deficits on intermittent consequence contingencies.

Prosthetic Consequences

Although most of the retarded behavior we have studied does not show marked deficits in interest or motivation attributable to inappropriate consequences, some discussion of this reflex component would be valuable for the
occasional individual who shows such deficits. Most retarded individuals respond at high rates with great perseveration. Their responding in average environments is inefficient mostly because they show little stimulus discrimination and poor response differentiation (Barrett and Lindsley, 1962).

**Individualized social arranged events** should be tried as consequences when normal social events do not maintain an adequate rate of responding. Casual observation of individuals with retarded behavior and a few laboratory experiments suggest that retarded individuals are either greatly deprived of social consequences or more accelerated by social than by non-social events. Conjugately programmed social contact with another person via closed-circuit television can be used to study within the laboratory the prosthetic value of social arranged events for retarded behavior. (See Nathan, Schneller, and Lindsley, 1964, for a description of methods.) In the classroom, social contact could be withheld and used to consequence the acquisition and holding of skills.

**Generalized accelerated consequences** or tokens should be considered as prosthetic techniques. However, one must realize that although tokens are ideal for classroom use with the educable retarded population, they might have limited application with the severely retarded because of their deficits in formation of learned accelerators; thus, most events are arranged events.

Expanded narrations may serve as accelerating consequences for retarded behavior that is not accelerated by the same narration presented at normal rates. The possibilities of expanded narration, suggested by Melrose's (1962) recent research, were discussed in more detail in the previous section on prosthetic stimuli or program event.

**Compressed narration**, in which narratives are played at higher than normal rates, could be tried as a prosthetic device for retarded behavior that cannot be prosthetized by expanded narration. Although I have no experimental evidence, I suggest this possibility because of the high interest of normal and retarded youngsters in extremely rapid music and chipmunk-singing sound effects. This field observation suggests that some retarded behavior might be highly accelerated by highly compressed music and social narration.

**Exaggerated social subsequent events** might also be tried as prosthetic accelerators for retarded behavior. Both regular and retarded children seem to show high interest in the exaggerated expressions on clown faces, in movie cartoons, and in movements of professional entertainers of children. Special educators might try exaggerating their smiles, approval, and caresses as prosthetic consequences.

It is true that the discovery and presentation of prosthetic devices have higher initial cost than the mass-produced average behavioral components which are now used in special education.
However, the use of prosthetic devices should generate such high rates of appropriate behavior in retarded individuals that the increased cost would be more than compensated for by savings in education, social welfare, and institutional care.

Conclusions

Free-operant methods show a special promise for laboratory analysis and both acquisition and maintenance prosthesis of retarded behavior.

There is mounting evidence that the more circumscribed behavioral deficits found in retarded individuals are easier to prostheteize by appropriately designed environments than are the psychotic deficits of wider scope. In fact, some of the deficits found in retarded behavior might even prove advantageous in certain environments.

A properly designed special school or class should treat individually and use maximally the behavior of its retarded students. Special educators should arrange suitable prosthetic programs for each student. The need for an individually tailored prosthetic program for each child should be continually tested to determine when the program can be efficiently reduced or replaced with a new program to generate a higher order of behavior.

Retardation is not the property of a child but of an inadequate child-environment relationship. It is our ability to design suitable environments for exceptional children that is retarded. Classrooms should be tailored to each child—not children adjusted to classrooms. Retarded behavior is penalized and any sub-skills ignored in environments designed for average children. In prosthetic environments tailored to their skills, exceptional children will behave adaptively, efficiently, and with full human dignity.

References


Ayllon, T. Person communication. 1963 (b)


Lindsley, O. R. Direct measurement and functional definition of vocal hallucinatory symptoms. *Journal of Nervous and Mental Disease*, 1963, 136, 293-297. (b)


Lindsley, O. R. A functional systematic analysis of schizophrenia. Paper read at American Psychopathological Association, New York, February 1964 (b)


Sidman, M. Tactics of Scientific Research.

Skinner, B. F. Science and Human Behavior.

Skinner, B. F. Cumulative Record. New York:

Spradlin, J. F. Effects of reinforcement
schedules on extinction in severely men-
tally retarded children. American Journal
of Mental Deficiency, 1962, 66, 634-640.

Weiner, H. Laboratory studies of "non-adjustive"
human operant behavior. Technical Report
No. 15, Behavioral Studies Branch, Saint
Elizabeths Hospital, Washington, D. C.,
December, 1963.

(Other articles of particular interest
authored by H. Weiner include:)

Weiner, H. Some effects of response cost upon
human operant behavior. Journal of
Experimental Analysis of Behavior, 1962, 5,
201-208.

Weiner, H. Conditioning history and human fixed
interval performance. Journal of Experimental

Weiner, H. Real and imagined cost effects upon
human fixed interval responding.
Psychological Reports, 1965, 17, 659-662.

Weiner, H. Conditioning history and maladaptive
human operant behavior. Psychological
Reports, 1965, 17, 934-942.

Zubin, J. Personal communication, 1963.
APPENDIX A
by
Clay Starlin

This appendix gives the reader a tangible example of how educationally relevant areas are analyzed in the precision teaching Is equation. Because all educational intervention is planned as a potential help in altering youngster's behavior, all planning must be set forth in terms of the Is language. If the teacher determines from her daily charts (which she keeps on each youngster) that a particular component of her plan successfully accelerated or decelerated a youngster's performance rate, she can then speak of this component in the Does language because it has been proven to do (to function) as planned.

Through the precision teaching Is equation, it is possible to analyze precisely what elements are present in a child's classroom environment, consequently enabling the teacher to individually tailor the program and arranged events for each child.

There are five target areas which are analyzed in the appendix. The first three are concerned with the academic areas of reading, math, and spelling. The final two are descriptions of two of the most frequent management problems occurring in the classroom: out of seat without permission and talking out without permission.

The last Is sheet in the appendix presents a detailed breakdown by equation components of the corrections made by the revisers. The chart that follows this sheet presents the respective rates on the precision teaching, six-cycle behavior chart paper. It is evident that the highest rate of corrections occurred in the acceleration arranged event area.8

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8The revisions made in this article have been instituted in accord with the present status of precision teaching (i.e., January, 1969). Because the system is dynamic and new, refinements are occurring rapidly in our attempts to upgrade and add precision to the presently available tools.

One hundred and thirty-six revisions were made in the article in 178 minutes. This is a rate of .76 changes per minute.

In a March 1969 presentation O. R. Lindsley altered an aspect of the precision teaching system once every hundred minutes! The present revision by no means constitutes the final word for further refinements, and revisions are definitely anticipated.
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<tr>
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<th>Program (P)</th>
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<th>PE</th>
<th>M Cycle</th>
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<tr>
<td>Jeff</td>
<td>8:00</td>
<td>T.dictates either /d/ or /b/ &quot;Remember you get to chart if they are all right&quot;</td>
<td>writes /b/ or /d/ correctly</td>
<td>±12:3</td>
<td>Jeff charts &quot;Good work&quot; Pat on back</td>
<td>8:00</td>
<td>1'</td>
<td>writes /b/ or /d/ incorrectly</td>
<td>1:0</td>
<td>No AE</td>
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<tr>
<td></td>
<td>8:03</td>
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<td></td>
<td>8:03</td>
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<tr>
<td>Teacher</td>
<td>8:00</td>
<td>Jeff writes /b/ or correctly</td>
<td>&quot;Good work&quot; Pat on back</td>
<td>2:1</td>
<td>Jeff says &quot;I am pretty smart aren't I?&quot;</td>
<td>8:00</td>
<td>1'</td>
<td>records the error</td>
<td>1:1</td>
<td>presents next dictated letter</td>
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</tbody>
</table>
|        | 8:03        | Hegge, Kirk and Kirk Remedial Reading Drills | blends all the words in 1 row correctly | 1:2             | "Good Reading" T. reads next row | 8:03 | 5' | makes an error in blending word(s) in 1 row | 1:2 | T. says "Jeff read another row. Jeff reads another row."
|        | 8:08        |                    |                    |                 |                   | 8:08 |     |                     |    |     |
| Teacher| 8:03        | Jeff blends all the words in 1 row correctly | "Good Reading" T. reads next row | 2:2             | Jeff smiles Jeff listens to teacher read | 8:03 | 1' | makes an error in blending words in 1 row | 1:1 | Jeff reads next row of words |
|        | 8:08        |                    |                    |                 |                   | 8:08 |     |                     |    |     |
| Jeff   | 8:08        | Merrill Linguistic Reader I Tape Recorder "I will tape your reading, when you read a sentence like this (demonstrate) will get to listen to the tape." | reads sentence correctly | 1:2             | "Good Reading" Jeff listens to tape | 8:08 | 10' | reads sentence incorrectly | 1:2 | does not get to listen to tape reads another sentence |
|        | 8:18        |                    |                    |                 |                   | 8:18 |     |                     |    |     |
| Teacher| 8:08        | Jeff reads sentence correctly | "Good Reading" | 1:1             | Jeff reads another sentence | 8:08 | 1' | Jeff reads sentence incorrectly | 1:1 | Jeff reads another sentence |
|        | 8:18        |                    |                    |                 |                   | 8:18 |     |                     |    |     |
## ACCELERATION

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<tbody>
<tr>
<td>Youngster in classroom</td>
<td>11:00</td>
<td>Basic division fact sheet</td>
<td>Division facts done correctly</td>
<td>middle &gt;of:3 week before</td>
<td>5 cents. next assign one credit toward game center</td>
<td>11:00</td>
<td>11:06</td>
<td>Basic division fact sheet</td>
<td>Division facts done incorrectly</td>
<td>Repeat assign &quot;failure&quot;</td>
</tr>
</tbody>
</table>

| Teacher         | 11:00       | Division facts done correctly | T. gives 5¢ and one credit | 2:1              | Youngster goes on to next assignment | 11:00  | 11:06  | Division facts done incorrectly | T. says you failed | 1:1                        | Youngster repeats assignment |

## DECELERATION

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<td>Basic division fact sheet</td>
<td>Division facts done incorrectly</td>
<td>Repeat assign &quot;failure&quot;</td>
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<tr>
<td><strong>Teacher</strong></td>
<td>3:00</td>
<td>Youngsters in seats with paper and pencil</td>
<td>T. says word, presents word in sentence, says word again</td>
<td>3:1</td>
<td>Each child writes word on paper</td>
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<td></td>
<td>3:15</td>
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<tr>
<td><strong>Class</strong></td>
<td>3:00</td>
<td>T. instruction 20 spelling words presented orally</td>
<td>Youngsters write spelling words correctly</td>
<td>20:1</td>
<td>A gold star placed on chart on bulletin board</td>
<td>3:00</td>
<td></td>
<td>Same as Acceleration PE</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>3:15</td>
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<td>3:15</td>
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<tr>
<td><strong>Teacher</strong></td>
<td>3:00</td>
<td>Class writes spelling words correctly</td>
<td>T. places gold star on bulletin board chart</td>
<td>1:2</td>
<td>Class claps and smiles</td>
<td>3:00</td>
<td></td>
<td>Class writes spelling words incorrectly</td>
<td>Tells youngsters who missed words to write them 10 times</td>
<td>1:1</td>
</tr>
<tr>
<td></td>
<td>3:15</td>
<td></td>
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**ACCELERATION**

**DECELERATION**

Target Area: Spelling
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<tr>
<td>Chris</td>
<td>9:00</td>
<td>Lippincott Reader 2-1</td>
<td>middle of week</td>
<td>Give a point</td>
<td>&quot;You're working hard today&quot; Pat on back</td>
<td>9:00</td>
<td>Lippincott Reader 2-1 &quot;It's time to work on your reading Chris&quot;</td>
<td>Out of seat without permission</td>
<td>1:2</td>
<td>Take a point Tell Chris to sit down</td>
</tr>
<tr>
<td>Chris</td>
<td>9:30</td>
<td>&quot;It's time to work on your reading Chris&quot;</td>
<td>Words read correctly (orally)</td>
<td>9:30</td>
<td>Lippincott Reader 2-1 &quot;It's time to work on your reading Chris&quot;</td>
<td>9:00</td>
<td>Lippincott Reader 2-1 &quot;It's time to work on your reading Chris&quot;</td>
<td>Words read incorrectly (orally)</td>
<td>1:0</td>
<td>None</td>
</tr>
<tr>
<td>Teacher</td>
<td>9:00</td>
<td>Child in seat working on reading</td>
<td>&quot;You're working hard today&quot; Pat on back</td>
<td>9:30</td>
<td>Chris smiles accelerates rate of reading</td>
<td>9:00</td>
<td>Chris is out of his seat</td>
<td>Take a point &quot;Chris please sit down&quot;</td>
<td>2:2</td>
<td>Chris sits Chris frowns</td>
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</table>

### DECELERATION
<table>
<thead>
<tr>
<th>Name</th>
<th>Program Event (P)</th>
<th>Program Event (PE)</th>
<th>Movement Cycle (M)</th>
<th>Arrangement (A)</th>
<th>Arranged Event (AE)</th>
<th>P</th>
<th>PE</th>
<th>M Cycle</th>
<th>A</th>
<th>AE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mike</td>
<td>8:30</td>
<td>T. presents list of ten spelling words for study - then gives test</td>
<td>Writes all spelling words correctly when tested</td>
<td>10:1</td>
<td>&quot;Good work&quot;</td>
<td>8:30</td>
<td>T. dictates ten spelling words</td>
<td>Mike spells one or more words incorrectly</td>
<td><strong>I:</strong></td>
<td>Works on ten spelling words</td>
</tr>
<tr>
<td>Mike</td>
<td>3:00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8:30</td>
<td>T. says &quot;Better study some more&quot;</td>
<td></td>
<td><strong>I:</strong></td>
<td></td>
</tr>
<tr>
<td>Teacher</td>
<td>8:30</td>
<td>Mike writes all spelling words correctly</td>
<td>T. says &quot;Good work&quot;</td>
<td>I:1</td>
<td>Mike returns to other activity</td>
<td>8:30</td>
<td>Mike spells one or more words incorrectly</td>
<td>&quot;Better study some more&quot;</td>
<td><strong>I:</strong></td>
<td>Mike continues working on spelling words</td>
</tr>
<tr>
<td>Name</td>
<td>Program (P)</td>
<td>Program Event (PE)</td>
<td>Movement Cycle (M)</td>
<td>Arrangement (A)</td>
<td>Arranged Event (AE)</td>
<td>P</td>
<td>PE</td>
<td>M Cycle</td>
<td>A</td>
<td>AE</td>
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<tr>
<td>-----------------------------</td>
<td>-------------</td>
<td>--------------------</td>
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<td>---</td>
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<td>---------</td>
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<td>----</td>
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<tr>
<td>Number of corrections in each component</td>
<td>8</td>
<td>6</td>
<td>18</td>
<td>6</td>
<td>87</td>
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<td>Rate of corrections in each component</td>
<td>.045</td>
<td>.034</td>
<td>.101</td>
<td>.034</td>
<td>.49</td>
<td></td>
<td></td>
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</table>

Total count = 136  
Total minutes = 178  
Total rate of change = .76
ANALYSIS BY EQUATION COMPONENTS

MANAGERS - ERIC HAUGHTON
CLAY STARLIN
PROTEGES - SELVES
JANUARY 1969

ACCELERATION
P PE MC A AE

DECELERATION
P PE MC A AE
# Inexpensive Teaching Aids — Curriculum Bulletins

School of Education, University of Oregon, Eugene, Oregon

## Curriculum Programs

<table>
<thead>
<tr>
<th>Discipline</th>
<th>Course Numbers</th>
<th>Dates Available</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health Instruction</td>
<td>161</td>
<td>...Gen. Organ.</td>
<td>.50</td>
</tr>
<tr>
<td>Science Experiences in Primary Grades</td>
<td>189</td>
<td>...</td>
<td>.50</td>
</tr>
<tr>
<td>Simple Theory of Second Sch. Music</td>
<td>207</td>
<td>...</td>
<td>.25</td>
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<tr>
<td>Status of Driver Ed. in H.S. in Ore.</td>
<td>214</td>
<td>...</td>
<td>.30</td>
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<tr>
<td>Kindergarten for Your Community</td>
<td>222</td>
<td>...</td>
<td>.90</td>
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<tr>
<td>The Junior High School Years</td>
<td>246</td>
<td>...</td>
<td>.50</td>
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<tr>
<td>Job Corps Innovations</td>
<td>270</td>
<td>...</td>
<td>1.30</td>
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<tr>
<td>The Oregon Six-Year Second Sch.</td>
<td>274</td>
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## Instructional Materials and Methods

<table>
<thead>
<tr>
<th>Discipline</th>
<th>Course Numbers</th>
<th>Dates Available</th>
<th>Price</th>
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<tbody>
<tr>
<td>Books for Young People</td>
<td>167</td>
<td>...</td>
<td>.50</td>
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<tr>
<td>Enriching American History (H.S.)</td>
<td>173</td>
<td>...</td>
<td>1.50</td>
</tr>
<tr>
<td>...Inter. Social Studies</td>
<td>188</td>
<td>...</td>
<td>1.50</td>
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<tr>
<td>Teaching Machines</td>
<td>211</td>
<td>...</td>
<td>.50</td>
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<tr>
<td>Science Books for the Elem. Sch. Lib.</td>
<td>212</td>
<td>...</td>
<td>.65</td>
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<tr>
<td>Bib. of Bib. of Free &amp; Inexp. Lrng. Mtrls.</td>
<td>216</td>
<td>...</td>
<td>.50</td>
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<tr>
<td>Programmed Instr. &amp; Teaching Machines</td>
<td>224</td>
<td>...</td>
<td>.70</td>
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<tr>
<td>The Utilization of Community Resources</td>
<td>225</td>
<td>...</td>
<td>1.05</td>
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<tr>
<td>Team Teaching-Gr. 5-6 Thru Part. Dept.</td>
<td>233</td>
<td>...</td>
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<tr>
<td>Bibliotherapy: An Annotated Bib.</td>
<td>234</td>
<td>...</td>
<td>1.30</td>
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<tr>
<td>Music &amp; Mentally Retarded Child</td>
<td>235</td>
<td>...</td>
<td>.50</td>
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<tr>
<td>Latin America</td>
<td>236</td>
<td>...</td>
<td>.55</td>
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<tr>
<td>Creativity Activity</td>
<td>246</td>
<td>...</td>
<td>1.05</td>
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<tr>
<td>Programmed Instruction</td>
<td>257</td>
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<tr>
<td>Bib. on Teaching Machines &amp; Prog. Mtrls.</td>
<td>263</td>
<td>...</td>
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<tr>
<td>Achievements Elem. Stu. of U.S. &amp; Brit. Isles</td>
<td>266</td>
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<tr>
<td>Remedial Reading Activities—An Idea Book</td>
<td>275</td>
<td>...</td>
<td>.80</td>
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<tr>
<td>Guidelines to Learning</td>
<td>279</td>
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## Philosophy and Objectives

<table>
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<th>Discipline</th>
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<tr>
<td>Philosophy Looks at Ed. (set)</td>
<td>217</td>
<td>221, 247</td>
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<tr>
<td>Liberal Arts View-Second. Curriculum</td>
<td>219</td>
<td>...</td>
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<tr>
<td>Diff. in Attitudes of Social Classes</td>
<td>231</td>
<td>...</td>
<td>.85</td>
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<td>Individualization of Instruction</td>
<td>237</td>
<td>...</td>
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## School Subjects

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<tr>
<th>Discipline</th>
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<tbody>
<tr>
<td>Improving Foreign Language Program—H.S.</td>
<td>226</td>
<td>...</td>
<td>.50</td>
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<tr>
<td>Health and Physical Education</td>
<td>161</td>
<td>Health Instr. in Sec. Schs.—Gen. Organ.</td>
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<tr>
<td>Unit in Home Nursing (H.S.)</td>
<td>177</td>
<td>...</td>
<td>1.00</td>
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<tr>
<td>Medford, Ore. Boys' Gr. Study: Abstracts</td>
<td>197</td>
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## Homemaking

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<th>Course Numbers</th>
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<tr>
<td>Unit in Home Nursing (H.S.)</td>
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## Language Arts

<table>
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<tbody>
<tr>
<td>Books for Young People</td>
<td>167</td>
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<tr>
<td>...Reading Readiness Tests</td>
<td>180</td>
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<td>Curriculum Dealing in the Language Arts</td>
<td>183</td>
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<tr>
<td>...Reading Games for Inter. Grads.</td>
<td>186</td>
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<td>Medieval Civilization (10th Grade)</td>
<td>200</td>
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<td>.60</td>
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<tr>
<td>Structural Ling. &amp; H.S. Grammar</td>
<td>223</td>
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<tr>
<td>School Newspapers — A Guide</td>
<td>228</td>
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<td>Profile of Ore. H.S. Publications Adv.</td>
<td>230</td>
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<td>Improving School Library Usage</td>
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<td>Word Attack Skills</td>
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<td>Spelling Achievement</td>
<td>249</td>
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<td>Handwriting: Recent Studies &amp; Opinions</td>
<td>257</td>
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<td>Application of Spelling Research</td>
<td>266</td>
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<tr>
<td>1/4/a The Hard Way: A Research Report</td>
<td>272</td>
<td>...</td>
<td>.50</td>
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<tr>
<td>Wither Elem. Lang. Arts in Space Age?</td>
<td>273</td>
<td>...</td>
<td>.40</td>
</tr>
<tr>
<td>Reading: A Controversial View-Research</td>
<td>278</td>
<td>...</td>
<td>.60</td>
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## Library

<table>
<thead>
<tr>
<th>Discipline</th>
<th>Course Numbers</th>
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<tbody>
<tr>
<td>Improving School Library Usages</td>
<td>240</td>
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<td>.75</td>
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## Mathematics

<table>
<thead>
<tr>
<th>Discipline</th>
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<tbody>
<tr>
<td>Underachievers in Arithmetic</td>
<td>250</td>
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## Music

<table>
<thead>
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<th>Course Numbers</th>
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<tbody>
<tr>
<td>Simple Theory of Second Sch. Music</td>
<td>207</td>
<td>...</td>
<td>.25</td>
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<tr>
<td>Music &amp; Mentally Retarded Child</td>
<td>235</td>
<td>...</td>
<td>.30</td>
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<tr>
<td>Teaching Canadian Folk Songs</td>
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## Science

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<th>Course Numbers</th>
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<tr>
<td>Domestic Animal Life... (1st Gr.)</td>
<td>163</td>
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<tr>
<td>Birds Along the Ore. Coast (Elem.)</td>
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<td>...</td>
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<tr>
<td>Home Nursing (High School)</td>
<td>177</td>
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<tr>
<td>Electricity &amp; Magnetism</td>
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<tr>
<td>Medieval Civilization (SS &amp; Eng. 10 Gr.)</td>
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<tr>
<td>Units on Use of Money (all levels)</td>
<td>248</td>
<td>...</td>
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<tr>
<td>Canada... (Elementary)</td>
<td>259</td>
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## Social Studies

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<th>Course Numbers</th>
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</thead>
<tbody>
<tr>
<td>Enriching American History... (Bib.)</td>
<td>173</td>
<td>...</td>
<td>1.50</td>
</tr>
<tr>
<td>Inter. Social Studies... (Bib.)</td>
<td>188</td>
<td>...</td>
<td>1.50</td>
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<tr>
<td>Medieval Civilization (10th Grade)</td>
<td>200</td>
<td>...</td>
<td>.60</td>
</tr>
<tr>
<td>Toward Clearer Underst.—Social Studies</td>
<td>229</td>
<td>...</td>
<td>.35</td>
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<tr>
<td>Latin America</td>
<td>236</td>
<td>...</td>
<td>.55</td>
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<tr>
<td>Biblio. for International Understanding</td>
<td>251</td>
<td>...</td>
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<tr>
<td>Mankind's Many Calendars</td>
<td>252</td>
<td>...</td>
<td>.55</td>
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</table>

## Annual Sets

- **1956-1960**, all issues **in print** (about 25), **$15.00**; **1961-1964**, all issues **in print**, **$5.00** per year; **1965**, **$7.50**; or **$40.00** for the complete set.