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The Process of Developing a Programmed Course in Christian Doctrine for Catachumens

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THE PROCESS OF DEVELOPING A PROGRAMMED COURSE IN CHRISTIAN DOCTRINE FOR CATACHUMENS

A Research Paper Presented to the Faculty of Concordia Seminary, St. Louis, in partial fulfillment of the requirements for elective P-200

by
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November 1971

Arthur C. Repp
Advisor
SHORT TITLE

PROGRAMMING A COURSE IN DOCTRINE
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CHAPTER I
THE NATURE OF THE INVESTIGATION

Purpose of the Research

This paper summarizes research into the area of programmed instruction, sometimes also referred to as programmed learning or as teaching by machine. This research is primarily an investigation of the principles and techniques of programmed instruction with the view of using these principles and techniques to write a sample learning program. The research which went into this paper is used in the paper to adapt the principles and techniques discovered for use in programming a course in Christian doctrine. The programmed course is intended for use by catechumens in their early years of adolescence as they approach the time when they will enter into Communicant membership in the Lutheran church. This paper is a first step in researching what place and use programmed instruction might have in the church.

Validation of the Research

Programmed instruction is a rather new and somewhat misunderstood educational development. Many people know nothing of programmed instruction. Some of those who do know something of it fear that it is the first step to-
ward the *Brave New World* of Aldous Huxley. The author's first encounter with programmed instruction was as an high school student in an American government class taught experimentally by programmed instruction. Results of that experiment were very encouraging. The author's interest in learning programs was revived during his vicarage when he was confronted with the problems of teaching Christian doctrine to children with little reading ability and almost no educational motivation. This paper is the first step in discovering ways for the advantages of programmed instruction to be brought to those special situations such as the author encountered during his vicarage, and also to all areas of the teaching ministry of the church. The author thinks church educators ought seriously consider programmed instruction as a viable option and a valuable tool wherever it can be used with good advantage in the church.

**Limitation of the Research**

This paper is limited to the process of developing a short instructional program. The process of development includes choosing the material to be programmed, defining the abilities of the students who will use the program, setting the goals of the program, writing the program with consideration of the various principles and techniques of programming, and testing, evaluating, revising, and retesting the program. The writer thinks a discussion of man as he is
viewed by the behavioral psychologist and a discussion of the advantages programmed instruction offers are helpful for the reader's understanding of the process of adapting programmed instruction for use in the church. This paper does not attempt to decide whether programmed instruction is a more worthy method than the more conventional methods of instruction. Neither does this paper attempt to study all of the applications which might be made of programmed instruction. Mention of specific applications may be made, but they are made only because and only where their mention aids in understanding how programmed instruction is adapted for use in the church. Further, this paper does not attempt to prescribe either the type of student or the situation best suited for programmed instruction. Again, any reference to these areas is with the idea that it is helpful in understanding the process of adapting instruction by program for use in the church. Also, this particular study does not treat the use of programmed instruction in the church in general, but only specifically in the area of confirmation instruction. Much of what is said about the development process as it relates to confirmation classes would, however, also be applicable to other areas of Christian education.

Definition of Terms Used

Observing behavior is the term programmers use for the activity of the student as he works through the program. It refers to the way in which the student behaves as he reads and responds to items in the program. A synonym for observ-
ing behavior is attention. Programmed instruction attempts to control the observing, or attention of the student so that a response is made which can be observed and measured.¹

A reinforcer is a signal to the student that his response is acceptable. Such reinforcement is given to the student immediately after he makes an acceptable response. A reinforcer may be any signal which the student understands as confirmation of an acceptable response.² In the sample program included in the Appendix, as in most programs, the reinforcers are in the form of the printed correct answer.

A lay lead in is an item which requires a response which can easily be made by the student on the basis of knowledge and skills which he brings to the program. The lay lead in relies completely on the previous background of the student.³

An SD, or discriminative stimulus, is any stimulus which stimulates the student to make an appropriate response. For example, a program may be devised which asks a student to make a response by pressing a certain button when he hears a certain type of sound. He is to ignore all other types of sound which he may hear. When he presses the button after he hears the type of sound he is to identify he is


²Ibid., p. 44.

³Ibid., p. 79.
reinforced by a light, or some other reinforcer. The sound which the student is to identify and respond to is the discriminative stimulus. 4

Prompts are signals in the program which aid the student in making the appropriate response. They are a type of discriminative stimulus. They are used to increase the probability that the student will make the appropriate response in the presence of a certain stimulus. 5

A formal prompt is a type of prompt which uses its particular form as a discriminative stimulus. 6 An underlined word in a sentence has a form which prompts the student to pay particular attention to that word and to consider it carefully in making his response.

A thematic prompt is similar to a formal prompt, except that it makes use of a theme rather than using its form. If the student has been led to think about cheese it likely his response to a stimulus will deal with cheese rather than with bricks or some other object. 7

Fading, or vanishing, is a technique employing the use of formal prompting. If the programmer wishes to teach the student a definition the programmer may fade the definition. The definition itself is the discriminative stimulus to which the

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4 Ibid., p. 27.
5 Ibid., p. 95.
6 Ibid., p. 67.
7 Ibid., p. 87.
student gives his response. As the program proceeds more and more words are blanked out, or faded, from the definition which the student is to learn. The student responds with the missing words until he has learned the whole definition. 8

Linear programs are written so as to follow a straight line of thought. The programmer takes the student from the level of the student at the beginning of the program along a straight, programmed path to the end of the program by gradual steps.

Branched programs are written with built in detours. If a student has difficulty at one of the branch points he is instructed to go to a different point where he begins a branch of the program. The purpose of this type of program is to give the student any remedial work he might need at any one of several steps.

The immediate application frame is a specially constructed item giving the student a piece of information. Once the student has this information he is asked to make a response on the basis of the new information. 9

Initial behavior is the sum total of the student's skill and knowledge before he begins the program.

8Ibid., p. 83.

Terminal behavior is the sum total of the knowledge and skills of the student after he has completed the course which the programmer wrote for him. This assumes that the program was successful in teaching the student what it set out to teach him. Terminal behavior is the initial behavior of the student plus what he learned from the program. The goal of the program is to move the student to the desired terminal behavior established by the programmer.

A panel is a table of information which the student is to refer in order to respond to portions of the program. The programmer may choose either to use or not to use panels, depending on the program. A Bible verse could be used as a panel.

A criterion frame is an item at or near the end of the program with the purpose of testing the student's progress toward terminal behavior on the basis of what he has learned from the program.10

A teaching machine is a mechanical device which presents the program to the student with even more control over the observing behavior of the student than the program alone is able to offer. Specifically, the teaching machine prevents the student from looking ahead in the program, cheating by looking at the answers before responding, and also from not

Assumptions

The author has two assumptions which bear listing for the reader. First, the author assumes that Christian doctrine can be put into the form of a learning program. Secondly, the author assumes that for this first step investigation in the field of programmed instruction and the process of adapting it for use in the church there is no need to prove that programmed learning can be adapted to special ministry situations, but rather the author assumes that it is satisfactory at this step to develop and test a learning program using a group of "normal" catechumens.

Overview of the Thesis

The body of this thesis begins with a discussion of man as he is viewed in the eyes of the behavioral psychologist. The author will show that even though a behavioral psychologist such as B. F. Skinner holds a view of man contrary to the view of man held by members of the Christian church programmed instruction can still be used as an educational tool in the church. The next section of the thesis treats some of the advantages of programmed instruction so the reader will be in a better position to understand the process of adapting

\[\text{\textsuperscript{11}}\text{Brethower, p. 133.}\]
programmed instruction for use in the church. The author goes on to discuss the considerations involved in deciding what it is that will be programmed. Reference is made to the author's reasoning in deciding on the material programmed in the sample program found in the Appendix. Next the author discusses the type of program which is to be used and the method of its presentation to the students. It is also necessary to discuss the role which the teacher has in a program instructed class. Again, comparison will be made to the sample program in the Appendix since these considerations affect the shape and type of the program which the programmer devises. After this the author discusses who the students will be and the specification of the initial behavior of the student. Next the author discusses the goals of the program as the programmer establishes them. This discussion includes a short discussion of the goals of Christian education with reference to setting goals for a learning program in terms of behavior. It is also necessary to discuss the behavioral psychologist's understanding of learning as a change in behavior. This discussion involves the process of establishing the terminal behavior toward which the program will move the student. Again reference is made to the process at this point as the author handled it in developing the sample program in the Appendix. After giving consideration to these preliminary matters the author discusses the techniques and principles involved in the actual writing of a program. These principles and techniques are illustrated with frames from the
sample program in the Appendix. After the discussion on the principles and techniques of writing a program the author discusses the problems of evaluating, testing, and revising a learning program. Finally, the author gives the conclusions of his research.

Previous Investigations

In 1962 the Board of Higher Education of the Lutheran Church--Missouri Synod sponsored a workshop on programmed learning at Concordia Teachers College, River Forest, Illinois. The workshop was held to familiarize church educators with programmed instruction and possible uses it might have in the church. The workshop noted that Frederick D. Kramer had developed and tested a learning program to be used in teaching Bible verse memory work to Lutheran elementary school children. He found that the children using the program enjoyed their memory work more but also took longer to learn it than did a control group using more conventional methods to learn memory work. The workshop also noted the efforts of Mr. Erich Helge of Immanuel Lutheran School of Kansas City, Missouri. Mr. Helge had begun to program several units on the Lord's Prayer with the idea of publishing his work after it was sufficiently tested.12

Methodology

The major source used by the author is Dale M. Brethower, *Programmed Instruction: A Manual of Programming Techniques*. Whereas this thesis deals with the process of developing a learning program for use by catechumens the author found Brethower very helpful as a guide to the construction of a learning program. That, in fact, is the main objective of Brethower's work. It is true that there are other manuals which treat programming technique, but the author found the work of Brethower to be the most helpful. The work of Brethower is in the form of a learning program. The author found working through a learning program which dealt with the topic of writing learning programs to be a most helpful way to study programming techniques and principles. Where other sources discussed programming technique Brethower could not escape actually illustrating it for the readers of his work. Where other sources were sometimes vague in their presentation Brethower gave the readers of his work the experience of the actual use of the techniques discussed. Another reason why the author chose Brethower as his major source is that the work of Brethower is based on over two years experience in actual programming research. His presentation in program form itself was field tested and revised on the basis of the experience of students using the program.

The author also consulted other authorities. They are
cited where they have something significant to offer which Brethower does not offer.

The author gathered information from various authorities on the construction and principle of learning programs and then set about using it to develop and test a program of his own. It is that program which is included in the Appendix.
CHAPTER II

THE DEVELOPMENT OF A LEARNING PROGRAM

The Behavioral View of Man

Programmed learning is a development from the field of behavioral psychology. The behavioral psychologist is interested in predicting and controlling human behavior. When one speaks of predicting and controlling human behavior many persons raise objections on the basis of ethical considerations. Christians considering the use of programmed instruction in Christian education are naturally interested in the ethical aspects of the way in which programmed instruction views human behavior, especially if their might be a basic conflict in the view of man between Christians and behavioralists. At this point the author wishes to discuss the way in which the behavioral psychologist views man and how his view of man affects programmed instruction, particularly as it is to be used in the church. Because B. F. Skinner is largely responsible for the development of programmed instruction his view of man is discussed here.

Skinner believes that human behavior is controlled from outside man rather than from within. He believes that an inner man who controls the actions of a person is a myth which

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people have perpetuated in order to explain actions they did not understand.\textsuperscript{14} Sin is not an entity which is part of the nature of a person, but instead a person sins because sin has become a reinforced part of the behavior of a person.\textsuperscript{15} Skinner believes that human behavior can be predicted and controlled as if it was a chemical reaction. In his new book, \textit{Beyond Freedom and Dignity}, Skinner outlines his plan for conditioning people to respond to group interests. He envisions programming an entire society tailor made to meet the wishes and expectations of the programmer.\textsuperscript{16} Skinner is a follower of the behavioralism of Watson, who rejected any concept of mind and emotion and described human behavior as reflex response to environmental stimuli. In the view of Watson environment alone controls what a man is and becomes. Watson was certain he could take a baby and condition it to enter any profession he decided regardless of its intellect or any other factors. \textsuperscript{17}

The behavioral view of man held by Skinner and Watson is not harmonious with the Christian view of Christian man as \textit{simul justus et peccator}. Their view of man also ignores the fact that not everyone is the same, but God has given

\begin{enumerate}
\item [\textsuperscript{14}] "Skinner's Utopia: Panacea, or Path to Hell?", \textit{Time} (September 20, 1971), 47-48.
\item [\textsuperscript{15}] B. F. Skinner, "Beyond Freedom and Dignity," \textit{Psychology Today} (August 1971), 78.
\item [\textsuperscript{16}] \textit{Time}, 47.
\item [\textsuperscript{17}] Ibid., 49-50.
\end{enumerate}
15
different gifts to each of his people. The question which needs to be asked is how a purely behavioral view of man affects the use of programmed instruction by Christians? Dr. David Allen Hubbard of Fuller Theological Seminary believes that the behavioral sciences can be employed in education by Christians without compromising the Christian view of man unless one uses the behavioral sciences in developing a whole philosophy of life as B. F. Skinner has done. If one develops a complete philosophy of life based on the behavioral sciences a conflict with the Christian view of man does certainly occur. Speaking to this same question, Harold Haas said, "Finally, we may note that PL (sic) is intrinsically neither good nor bad, moral nor immoral, any more than educational movies, slides, and tape recorders are moral or immoral." He further stated, "Our responsibility as committed Christians is to see that they are used to the glory of God and the welfare of our fellow men."

Regardless of any possible conflict over the view of man and the avoidance of a conflict through limiting one's use of

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18 I Corinthians 12

19 Dr. David Allen Hubbard as interviewed by Douglas Edwards on "The World of Religion" broadcast November 7, 1971 by the Columbia Broadcasting System.


21 Ibid.
the behavioral sciences away from a total philosophy of life, some might wonder about the possibility of a programmer being able to brainwash students. To this point Green wrote, "Programmed instruction is no more likely to 'brainwash' students than is the biased lecture of a gifted platform artist."22 As an educator Green in convinced that the learning process is not controlled differently in any essential way by programmed instruction than it is under the usual schoolroom conditions.23

The author agrees with Haas that programmed instruction is only a method which Christians can and should put to good use. The author also agrees with Hubbard that so long as programmed instruction and the behavioral sciences do not become the basis of a total philosophy of life there need be no conflict between the way a behavioralist like Skinner views man and programmed instruction as it is used by Christians in Christian education. Further, the author agrees with Green that a person is no more likely to be brainwashed by programmed instruction than by any other procedure.

Advantages of Programmed Instruction

A brief mention of some of the advantages of using programmed instruction is herewith given. The author does this because an understanding of the advantages of programmed instruction will help the reader to better understand how pro-

22 Green, p. 205.
23 Ibid., p. 112.
grammed instruction might be adapted for use with catechumens in order to make use of these advantages. Much of this dis-
cussion would also apply to adapting programmed instruction for use in the church in general.

Learning programs are guaranteed to be understandable by the student. A new program is tested, revised, and tested again and again with students until students are able to work through the program with very few errors. Learning programs have been shown to be as efficient when the sole method of instruction as the entire conventional procedure of lecture, homework, and individual or class help. In addition, pro-
grammed courses require less time of the student to learn the same material than does the more conventional approach. A good learning program requires the student to pay attention to each frame, or item, if he is to complete the program. He can not skip around as he might with a textbook. Evidence shows that even if a student cheats during a program by peek-
ing at the answers he still learns. Administration of tests by the teacher can be cut to a minimum when a programmed course is used because the program is continually testing the student's grasp of material by asking him to make responses on the basis of what he has learned. Most students find programmed in-
struction automatically encouraging because they immediately learn that their response was correct. If a student makes an incorrect response it is automatically discouraged so that the next time he will more probably make the correct response and be automatically encouraged. The constant encouragement
offered by programmed instruction has been known to produce
good effects on the attention span, reading skills, and work
output of the students. If the student has difficulty in
learning the material presented in the program his responses
will show the exact area of difficulty and the teacher can
give the student extra help. Many teachers find that
through using programmed instruction in at least a portion
of their classes they gain valuable insight into the way
their students learn and the special difficulties their
students have so that the teachers become better teachers.
With programmed instruction the slower student can go at his
own pace. He need not feel he is holding back the class, nor
does he have to be ashamed of his answers. He can work
knowing that when he has completed the program his grasp of
the material and his grades will be about the same as those
who were able to proceed at a faster rate. Programs can
also be written so as to be used with as many as three dif-
ferent grade levels using the same program. Differences in
intelligence and of background effect only the time the stu-
dent uses to do the program and may slightly effect the number
of student errors unless the differences are extreme.

21 Michael Schriven, "The Case for and Use of Programmed
Texts," Programmed Instruction: Bold New Venture, edited by
Allen D. Calvin (Bloomington, Indiana: Indiana University Press,
25 Ibid., p. 19.
26 Ibid., p. 20.
27 Ibid., p. 6.
If the competence of the teacher is a problem a good programmed course serves to place a floor below the performance of the teacher and insure certain minimum standards of excellence.\(^{28}\)

Selecting Material to be Programmed

The programmer must decide what it is that he wishes to teach by way of a program. The author has already stated that his purpose is to write a program for teaching Christian doctrine to catechumens. The author chose to program material dealing with the nature of the Sacrament of the Altar. The nature of the Sacrament of the Altar is a unit which can be isolated and taught without a great deal of background material having to first be taught. Other sections of Christian doctrine could just as well have been used for the sample program which the author wrote. The author chose to use the presentation of the Concordia Catechism Series as his source and guide in writing the sample program.\(^{29}\)

After the programmer has chosen the material which he will program and defined the limits of his treatment he must organize it in an order and progression suitable for programming. Even though the material chosen may already be in logical order, it

\(^{28}\)Ibid., p. 22.

\(^{29}\)Richard J. Schultz, "What is the Sacrament of the Altar?", This is the Christian Faith, Concordia Catechism Series, edited by Walter M. Wangerin (St. Louis: Concordia Publishing House, 1967), pp. 208-211.
is not necessarily in an order which lends itself to programming. Material in a program must not only be in a logical order, but it must also be arranged in such a way that the transition from one point to another is as natural and as smooth as can be. Schultz's material in the Concordia Catechism Series is in logical order for a reader, but the author found it necessary to change the order of the points which Schultz makes for purposes of putting his material in the form of a learning program. Testing the program with students for whom it was designed helps the programmer to find the proper sequence for the material should he find that he has planned poorly. 30

The Use of the Program and the Role of the Teacher

Before he can write a program the programmer must know what use he will make of the program. 31 Programmed instruction may be used either as a supplement to the learning experience, or it may be used as the sole learning experience of the student. If a textbook is used in the learning experience programmed instruction could be used to introduce the student to basic material and main concepts so that he is a more careful reader of the textbook. 32 If the programmer chose to use the

30 Schriven, p. 20.
31 Green, p. 148.
program in this way he would not write a program which was long and very comprehensive in its treatment of the material. But in accord with his purpose and planned use of the program the programmer would make a shorter and more basic presentation in his program. This is a very good approach. A program might also be used to teach a concept difficult to teach by some other means.\textsuperscript{33}

Generally programmed instruction should not be used as just another form of homework for the student. It is much more than that. It is an alternate way of teaching. The teacher should not exactly duplicate the material taught in the program in the regular classroom presentation.\textsuperscript{34} Because programmed instruction is an alternate method of teaching the programmer may easily choose to let it stand as the sole method of instruction, depending on needs and circumstances. In that case the programmer would write a rather detailed and comprehensive program.

The sample program which the author wrote is designed to be used as an introduction to basic material. The sample program is designed to give the student a very good background, but also to leave room for expansion further illustration by the teacher.

Programmed learning does not replace the teacher by any means. When programmed instruction first appeared the em-

\textsuperscript{33}\textit{Ibid.}, p. 3.

\textsuperscript{34}\textit{Ibid.}, p. 6.
phasis on teaching machines led many to think that the place of the teacher was about to vanish. The contributions of the teacher are eliminated by programmed learning only if the teacher never had anything to contribute anyway. If anything programmed instruction provides a unique opportunity to utilize the distinctive talents of the individual teacher as never before. Young students very much need a person to serve as a model for their development. Programmed learning gives the teacher a place wherever human skills are required. Because the program has done much of the teacher’s normal preparation and teaching the teacher is freed to spend time developing special learning activities which augment and expand what the student learned in the program. The teacher is also very needed to help those students who are slower or have difficulty with some of the material they are being taught.

Linear and Branched Programs

The programmer must decide if he wants to use a linear

35 Schriven, p. 27.


37 Ibid., p. 5.

38 Schriven, p. 19.

39 Supra, p. 18.
or a branched program. A linear program is easier to write and faster to produce. A branched program provides remedial material for students who need extra exposure to the material or a slower presentation. In some programs the errors of the poorer students may have caused the programmer to revise the program in favor of their level of performance. This would tend to bore and hold back the faster students, and might be a good reason to use a branched program. 40

Schriven prefers a good linear program to a branched program and says that most students do also. He finds that students do not enjoy being told that they made a mistake and must do extra work to compensate for it. Part of his preference for linear programs is in opposition to the extra effort involved in producing a good branched program. 41

The author also prefers linear programs to branched, agreeing with Schriven. If a class using programmed instruction was made up of students covering an extremely wide spectrum of intelligence a branched program might be necessary to keep from boring the bright students and still give the slower students the remedial work they needed. If a class was made up of students where the brightest and the dullest were not poles apart in mental capabilities a good linear program would work


41 Schriven, pp. 15-18.
very well. The author assumes that the members of the "normal" confirmation class for whom his sample program was designed are not poles apart in mental ability and that any slow students can be instructed with the aid of some individual attention, if necessary. For these reasons, the author's sample program is a linear program.

Programmed Texts and Teaching Machines

Not all learning programs are administered by means of a teaching machine. Many are printed in the form of a printed text. Printed texts are much more portable than are teaching machines, and often more portable than the programs teaching machines use. Texts are also able to be used under many divergent conditions. Many machines require that they be near a source of electric power.42

The ideal teaching machine is completely protected against student cheating. The machine presents the material in a sequence of one item following another. It requires a response from the student before it will advance to the next frame. It gives the student immediate feedback and reinforcement.43

Studies show no difference in results and performance between groups using machines and groups using programmed texts, but machines are more expensive than are programmed texts.44

43 Green, p. 128.
44 Schriven, p. 13.
Teaching machines cost from twenty-five dollars for a simple molded plastic machine to over 6,000 dollars for an elaborate machine which administers driver education programs costing eighty dollars each.45

From the viewpoint of economics programmed texts are probably more practical than machines, particularly for use by churches. If the programmer can trust his students not to cheat and so sabotage the purpose of the program a programmed text is adequate. The author has assumed the students for whom his sample program was designed can be trusted to that extent, and so the author's sample program is in the form of a programmed text.

The Students

The programmer must know who the students are and what they can do or his program may fail before it is written. Describing what the students know and what they can do with that knowledge is referred to as the specification of the students' initial behavior. It is important that the programmer accurately specifies the initial behavior of the students or they may not be able to respond correctly to the first items of the program.46


The author has developed his sample program for an average Lutheran catechumen. The author envisions an average Lutheran catechumen as between the ages of twelve and fourteen. He is of average intelligence and is able to read on a level corresponding to his age and schooling. The author has chosen to write the sample program for a student who has attended Sunday School fairly regularly, but does not have a Christian Day School education. He attends church regularly with his parents. He has seen people attending the Sacrament of the Altar, but has had no instruction about the nature of the Sacrament yet.

The Goals of the Program

Just as the programmer must establish what the student can do before the program, he must also establish what the student is to do at the end of the program. Programmers refer to this as the specification of the desired terminal behavior.\textsuperscript{47}

At this point it might be well to more fully describe what is meant by terminal behavior. Programmers refer to learning as a change in the behavior of the student.\textsuperscript{48} The program does not seek to produce understanding or even ability to do something, but the programmer wants the program to alter the student's behavior so that he does some-

\textsuperscript{47}Ibid., p. 37.
\textsuperscript{48}Green, p. 40.
thing he did not do before, or at least does something differently from what he did before the program. If the programmer sees that the behavior of the student is changed in some way he knows that the student also understands and has the ability to do what he was taught in the program.\textsuperscript{49}

When the programmer specifies terminal behavior he must translate the concepts of knowledge which he wishes to teach in the program into behavioral terms. Green lists several questions the programmer may ask himself in order to help the programmer to translate concepts into terms of behavior. The programmer may want to ask what the student should be able to do when he completes the program, what verbal skills the student should have, what questions the student should be able to answer, and what discriminations the student should be able to make.\textsuperscript{50} Ward also lists several similar questions which may be of help to the programmer. He suggests the programmer ask what the student must do to demonstrate his learning, under what conditions the desired learning is considered adequately demonstrated, and what level of performance is considered adequate by the programmer.\textsuperscript{51}

There is a problem encountered in Christian education which is not encountered in secular education. Secular edu-

\textsuperscript{49} Brethower, p. 25.
\textsuperscript{50} Green, p. 149.
\textsuperscript{51} Ward, p. 17.
cators avoid setting educational goals where there is no way to measure those goals. Christian educators seek to bring an increase in such things as faith and devotion, which are not able to be quantified according to human systems. The principle of setting only those goals for education which can also be measured does not apply in Christian education. Christian educators set goals remembering that they are the instruments through whom God works to bring increase. Any increase comes only through the Holy Spirit and can be measured by Him only.

The author set the same goals for his sample program which Repp discusses as qualifications for the communicant. The communicant is to see the bread and wine in the Lord's Supper as being different from ordinary bread and wine, and to recognize the real presence of the Lord's body and blood in the Sacrament. In addition, the sample program which the author wrote teaches the student to recite a definition of the Lord's Supper and to be conversant with the various names which Christians use for the Sacrament of the Altar. These goals are stated in good behavioral terminology as they should be for a learning program.

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53 Ibid.
54 Ibid., p. 169.
Principles and Techniques of Programming

When the programmer has made decisions on all of the above considerations he is finally ready to begin writing his program. Naturally the programmer wants his program to be a good one. Unfortunately, no one can prescribe a set of principles and techniques which guarantee a successful learning program. There are basic principles and useful techniques which should be followed in writing an instructional program, but they are only guides. Writing a good learning program is much like writing a good book. In either case no one can tell another person exactly how it is done. The student is the final judge of the quality of a learning program.55

In principle the programmer simply "arranges conditions so the desired responses will be emitted and reinforced" by the student.56 A good learning program immediately reinforces student responses, requires emission of responses, progresses gradually through the material, fades prompting as the program progresses, controls the student's observing behavior, educates in a variety of ways through controlled use of examples, and is modified to fit the student.57

The observing behavior of the student is controlled through the use of a blank to be filled by the student. In order to

55Green, p. 139.
56Brethower, p. 21.
57Ibid., p. 237.
complete the blank the student is required to pay attention to what he reads. 58 Multiple choice responses might also be used to control the attention of the student. 59 Completing a blank item is not difficult, but the program must be designed in such a way that the student is required to learn and use the material presented by the program in order to give his response. If the student was not controlled in this way he could easily complete all responses without using the material presented by the program. Under such conditions the student would learn nothing. 60 These are the general principles which underlie the writing of a learning program.

From this point forward the author wishes to illustrate specific techniques by means of frames from the sample program in the Appendix. Although the author has made a sincere attempt to select frames which are illustrative of the technique under discussion, in many cases one frame pulled from its context in the whole program loses its illustrative value. The author suggests that the reader might be best served by reading the sample program at this point, or by regularly turning to the reference in the sample program and reading one or two items immediately proceeding and following the frame chosen for illustration.

When the programmer constructs a frame he does not

58 Ibid., p. 117.
59 Ibid., p. 181.
60 Ibid., p. 219.
simply write a sentence and then arbitrarily erase a word or two. Instead he gives careful consideration to what it is that the frame in question is to teach. 61

9. At the Passover meal the disciples ate (bread) and drank (wine) which Jesus gave them. 62

Frame number nine is designed to teach the student that it was bread and wine which Jesus gave the disciples. The observing behavior of the student would have been just as well controlled had "Jesus" been called for as a response instead of "bread" and "wine". The responses for this item were very carefully chosen to lead into the Words of the Institution, which follow in the next items. The student is to learn that the elements men eat and drink at the Sacrament are bread and wine. This item aids other frames teaching the place of the bread and wine.

All the items in a program are to give new information, or to give new examples and contexts for expansion of the student's understanding of the concept. 63

2. While the people were in the desert their bodies grew weak. God gave them food so they could be (strong) again. 64

3. We also need strength from God because many times in our life our spirits and our faith become (weak). 65

61 Ibid., p. 177.
62 Infra, p. 45.
63 Brethower, p. 193.
64 Infra, p. 46.
65 Ibid., p. 47.
Frame number two introduces the concept that God provides strength for his people and their bodies. Frame number three expands the student's understanding of the concept to include the spiritual strength which God's people also need.

Frames two and three are also illustrative of other programming techniques. New information and new concepts may be introduced in the program after a basic concept has been only partially introduced. The new concepts are related to the old in such a way that they serve to expand the student's understanding of the old while introducing new information. This technique enables the programmer to introduce extensions of the original concept and also help the student to review what he has learned about the original concept. The author did not make full use of this technique in frames two and three, but could have if it had been in the best interest of the program. If the author had been developing a program dealing with the providential care of God, he could have used frames two and three to expand the student's understanding of God as the "provider of material blessings" to further include the concept of "God as provider of spiritual blessings also". Introducing the second concept at this point would have also helped the student to review what he knew about the first, as well as expanding the first concept to include

66Brethower, p. 193.
its relation to the second. The whole process of relating new concepts to concepts already partially established does require more than two frames. This discussion has described how the process could have been initiated by frames two and three.

Frames two and three also illustrate the small step of progression which is made from one frame to another. Care must be taken that the programmer does not proceed too rapidly. If he does proceed too rapidly he may lose control over the student and the purpose of the program will also be lost. Again, there are no rules which tell the programmer exactly how fast is too fast. Skinner has found that the optimal size of each progressive step from one frame to another is something which must be determined through experimentation.67 The maximum amount of progression in expanding old material and introducing new is largely determined by the capabilities of the student using the program.

Brethower finds that calling for the student to make a response in several grammatical forms is a useful technique.68 This technique has been employed in frames fifteen and seventeen.69 Both frames discuss the real presence of Christ's body and blood in the Sacrament. Frame fifteen calls for the response "Real Presence". Frame seventeen calls for "really present" as

67Green, pp. 114, 115.
68Brethower, p. 71.
69Infra, pp. 51, 45.
a response. However, Brethower cautions against asking the student to make the same response in several successive frames.

Frame number one of the sample program employs the lay lead in.

1. After they left Egypt, the children of Israel were in the desert for forty years before arriving at the land promised to them by (God).

The knowledge which allows the student to make an acceptable response to frame number one is part of his initial behavior. The students for whom the author designed this program are familiar with the exodus from Egypt and can easily make the correct response.

A formal prompt may be in the form of an underlined word. In frame number fifteen "really present" is underlined, formally prompting the response of "Real Presence".

15. If we believe Christ's body and blood are really present with the bread and wine we believe in the Presence.

Additional formal prompting is given this item through the use of a blank for each letter in the response as well as the first letter of the response given to the student. One frame is seldom as saturated with prompts as item fifteen. Still, frame fifteen was a cause of student error during the testing of the sample program.

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70 Brethower, p. 207.
71 Infra, p. 45.
72 Brethower, p. 93.
73 Infra, p. 51.
Frame number twelve makes use of thematic prompting.

12. When we go to the Sacrament of the Altar we, too, receive Christ's own (body) and (blood). 74

Frame eleven teaches the student that Christ's disciples received His body and blood. The theme of receiving Christ's body and blood serves as a prompt for the correct student response to frame twelve.

Frame number thirty-three asks the student to refer to a panel and to make his response on the basis of information found in the panel. The panel to which the student is to respond is a verse from the Bible.

33. Find I Corinthians 11:24 and 11:25 in your Bibles. How does Jesus say we are to celebrate the Sacrament of the Altar? Write the last six words of verse 24. "(Do this in remembrance of me)." 75

Panels are either included with the frame to which they apply, or they are put at some other place in the program for easy reference by the student. Green cites research indicating that students tend to not use panels. 76 For that reason the author wrote frame thirty-three in such a way as to force the student to use the Bible as a panel.

Research indicates that students tend to ignore anything following the blank in a frame. 77 The reader will notice that nearly all frames in the sample program are written with the

74 Ibid., p. 48.
75 Ibid., p. 46.
76 Green, p. 154.
77 Ibid.
blank occurring at or very near the end of the frame. When it was not possible for the blank to occur at the very end the author made every effort to give all important information before the blank.

Frame number forty-six is a criterion frame. It tests the student's learning of what has been taught earlier. It asks the student to give four names for the celebration in which Jesus gives us His body and blood with the bread and wine. This discussion of the criterion frame is adequate and there is no gain in reprinting frame forty-six here.

Of late programmers have come to look more favorably than previously on the use of frames constructed around a question rather than a blank. Generally, the programmer gives the student a piece of new information and then asks him to respond on the basis of the new information. This technique is referred to as an immediate application frame. Frame number six is a type of immediate application frame.

6. The name of the extra source of strength which Jesus gave His disciples and us is the Sacrament of the Altar. Write the name of the extra source of strength which Jesus has given us.

This frame is not an extremely challenging one, but it does give the student a piece of new information and ask for a response.

78 "The Development of Quality Control Procedures for Programmed Learning" from Programmed Learning Workshop.

79 Infra, p. 51.

80 Deterline, pp. 190, 191.

81 Infra, p. 50.
on the basis of that information. A more challenging variation of this technique might ask the student to make a decision or a discrimination on the basis of the new information. 82

The author has included a series of frames in the sample program designed to teach the student a definition from memory. According to Brethower, any definitions taught the student are to be introduced only after the student has been taught the use of the concepts which are used in the definition. 83 The author has followed this approach. The definition taught, which defines the nature of the Sacrament of the Altar, comes after the student has learned about the nature of the Sacrament. Frame twenty introduces a portion of the definition.

20. What is the Sacrament of the Altar? It is the true body and blood of our Lord Jesus Christ under the bread and wine. 84

Frame twenty does not call for a response, but directs the student to proceed to the next frame. Frame twenty is only an information frame. Such frames are not used frequently. Frame twenty-two adds another portion of the definition after the student has learned the concept behind it, and fades two words for the student to supply as a response.

22. What is the Sacrament of the Altar? It is the true body and blood of our Lord Jesus Christ under the (bread) and (wine), instituted by Christ Himself. 85

82 Deterline, p. 190.
83 Brethower, p. 63.
84 Infra, p. 48.
85 Ibid., p. 50.
With frame twenty-five the definition is complete and more words have been faded from familiar portions of it.

25. What is the Sacrament of the Altar? It is the true **(body)** and **(blood)** of our Lord Jesus Christ, under the **(bread)** and **(wine)**, for us Christians to **eat** and **drink**, instituted by Christ Himself.86

More words are faded from the definition with each succeeding frame until only blanks remain.

30. What is the Sacrament of the Altar? ____
   ____ ____ ____ ____ ____ ____ ____ ____ ____,
   ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ 87 __

The relative size of the blanks together with the punctuation serves to formally prompt the student. The programmer wants the student to be able to give the definition without any prompting. Frame thirty-one asks the student to respond without the benefit of prompting.

31. What is the Sacrament of the Altar? ______
   _____________________________
   _____________________________. 88

The author learned this technique through working through the work of Brethower, who teaches his students several definitions in this same way.89

The author has illustrated the use of the techniques of programming with selected frames from the sample program.

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86 Ibid., p. 45.
87 Ibid., p. 50.
88 Ibid., p. 51.
89 Brethower, passim.
The frames selected for illustrative purposes are not the only frames employing these various techniques. Neither do all of the frames employ all of the techniques discussed. Techniques are tools which the programmer uses according to his purpose and his skill in programming.

Testing and Revision of the Program

No learning program is good simply because someone has put material to be learned into program form. A bad program is no better than anything else poorly done. But, a good program properly developed and administered produces real results. The only way to be sure a learning program is good is to test and revise it until it is good. The student shows the programmer how successful his program is by the way the student learns the material presented in the program.

In general, programmers use student error rate as the basis of program revision. If student errors are widespread throughout the program the programmer knows that the entire program is too difficult for the students using the program. Such a program needs thorough revision. It is important that students make few errors. When student errors are few they are likely to occur in only a few places throughout the program.

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90 Schriven, p. 5.
91 Green, p. 203.
92 Ibid., p. 140.
Those items which are frequently missed by students can be revised by the programmer. Keeping student errors low through revision of the program helps to keep student motivation high. The programmer is also interested in revising frequently missed items because programmers find that items frequently missed are poorly learned and quickly forgotten.

On the basis of experience most programmers agree that an error rate of about ten per cent is a desirable error rate. A program with an error rate of about ten per cent is not so easy that the student can work through it without learning, and not so hard that control of the student's observing behavior is lost. Error rate is one of the best indicators of need for revision which programmers have. When the author tested his sample program he finally arrived at an error rate of eleven per cent, indicating that most of the need for revision had been met. However, Holland points out that error rate is not a foolproof indicator that the program is successful. The programmer may arrive at a low error rate by making most of the items too easy. When items are too easy the student learns nothing.

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93 Brethower, p. 215.
94 Ibid., p. 209.
95 Ibid., p. 219.
96 Ibid., p. 109.
97 "The Development of Quality Control Procedures for Programmed Learning" from Programmed Learning Workshop.
Some of the revision of the program can be done by the programmer himself before he tests it with students. The programmer should make a list of the responses called for by the program and the frequency of each response. Doing this enables the programmer to see if he has selected responses which are likely to be repeated in the presence of the desired discriminative stimuli, if the selected responses cause the student to pay close attention to the material in each of the frames, and if the student is being required to use what he learned earlier in the program. The programmer should pretend he is a student and should read each item carefully. Any items which are unclear or out of sequence should be revised. The programmer should also attempt to guess what incorrect responses the students will make and revise the program so they can be avoided.

The real test of a program comes when it is used with the students for whom it was designed. The programmer may decide to test his program with a large group of students simultaneously. Gilbert suggests that rather the programmer ought give his program to individual students, making revisions

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98 Brethower, p. 185.
99 Ibid., p. 187.
100 Ibid., p. 217.
101 Ibid., p. 219.
102 Ibid., p. 167.
after each student uses the program. He says that this procedure gives the programmer skill at adjusting the program for individual student differences. Gilbert finds that before the programmer has tested his program with even ten students he will have modified the program to fit the needs of at least ninety-eight per cent of the students who will ever use the program.\textsuperscript{103} The author tested his sample program in this way and can attest to the insight this method gives into individual differences and how to modify the program to fit them. One of the author's main reasons for adopting Gilbert's method was the factor of time. The author found it easier and less time consuming to arrange for testing with single students rather than with a large group of students.

The actual revision of a program may involve changing the wording of some frames to remove any ambiguity or lack of clarity. Most often revision of a program means that extra frames must be added to the program so that the progression of the program is more gradual.\textsuperscript{104} The author found that both of these were necessary in revising the sample program.

Conclusions

Programmed learning may be used by Christian educators without any difficulties and conflicts arising over the view of man held by many behavioral psychologists. Programmed

\textsuperscript{103} Green, p. 116.

\textsuperscript{104} Brethower, p. 111.
instruction is an educational method no more harmful or likely to brainwash students than is any other. Instead, programmed instruction has many features and benefits which could be put to good use in educating catechumens in Christian doctrine. Programmed instruction may be used with or without a teacher also giving instruction. The programmer must decide how the program will be used and administered before writing the program so that he knows what shape and direction the program should take. The author prefers programmed texts over programs written for teaching machines because he deems texts more practical and versatile, not to mention less expensive. When the programmer is ready to begin programming he must have a clear idea of both the abilities and knowledge of the students and the goals of the program. When the programmer writes a program in Christian doctrine, or any other subject, he makes use of programming techniques established through research and testing. Employing these techniques to their fullest potential requires skill which the programmer gains through experience. Student performance is the final test of any program and leads to revision of the program to fit student needs.

Writing a good program and testing it requires a great deal of time. It would not be worthwhile for each person desiring to use programmed instruction to write his own programs in Christian doctrine. If someone developed a good series of programmed materials in Christian doctrine and made them available to all who would want to use them the work would be worth the results.
APPENDIX

What is the Sacrament of the Altar?

Quite commonly learning programs in the form of a printed text are arranged with one frame following another down the page. When the student reaches the bottom he turns the page and begins again at the top of the second page. The reinforcers appear in a column to the left or to the right of the frames. This format depends heavily on the student to keep a cover sheet over the reinforcer for a particular frame until the student gives a response to the frame.

The format which the author has chosen to use in the sample program is adapted from the format which Brethower uses in his book cited above. With this format no cover sheet is needed. The reinforcers can not be seen by the student until he turns the page. The student is to make a response, turn the page for the reinforcer, read the next frame and make a response again. When the student reaches the last page of the program he is to return to the first page of the program and work through the second row of frames to the back page. The student continues working through the program row by row until he reaches the end of the program at the end of the bottom row on the last page of the program.
1. After they left Egypt, the children of Israel were in the desert for forty years before arriving at the land that was promised to them by ____.

9. At the Passover meal the disciples ate ____ and drank ____ which Jesus gave them.

17. Real Presence means that we really receive the body and blood of Jesus. It means they are actually, or __________ present.

25. What is the Sacrament of the Altar? It is the true ____ and ____ of our Lord Jesus Christ, under the ____ and ____, for us Christians to eat and to drink, instituted by Christ Himself.

32. Now you know what the Bible teaches about the question, "What is the Sacrament of the Altar?" The Bible also tells us how we are to celebrate the Sacrament. Go on to the next frame.

40. "In remembrance of me" means we remember the One giving us His ____ and ____ under the ____ and ____.
2. While the people were in the desert their bodies grew weak. God gave them food so they could be _______ again.

10. When He gave the bread and the wine to the disciples Jesus said, "Take, eat, this is my body," and, "Take, drink, this ___ my blood."

18. Find I Corinthians 10:16 in your Bible. St. Paul mentions four things which are present in the Sacrament of the Altar. What are they?

26. What is the Sacrament of the Altar? It is the true and ___ of our Lord Jesus Christ under the ___ and ___ for us Christians to eat and to drink, instituted by ___ Himself.

33. Find I Corinthians 11:24 and 11:25 in your Bibles. How does Jesus say we are to celebrate the Sacrament of the Altar? Write the last six words of verse 24. "___" (Use the Revised Standard Version of the Bible.)

41. The Sacrament of the Altar has several other names. One is the Supper of the Lord, or the Lord's ___.
3. We also need strength from God because many times in life our spirits and our faith become ____.

11. Along with the bread and wine which they ate and drank, the disciples also received Christ's own body and ____ in a very wonderful and mysterious way.

19. Some people believe the bread and wine are changed into Christ's body and blood. They believe only Christ's body and blood are present. We believe that Christ's body and blood are present in, with, and under the ____ and the ____.

27. What is the Sacrament of the Altar?

34. Jesus said, "Do this ___ _____."

42. The Greek word Eucharist, meaning "giving of thanks", is another name for the Sacrament of the Altar. Write the word Eucharist. _____
(3) weak

4. God makes us strong through hearing and learning His Word. What is the name of the Book that we also call the Word of God? ____________

(11) blood

12. When we go to the Sacrament of the Altar we, too, receive Christ's own ___ and ____.

(19) bread wine

20. What is the Sacrament of the Altar? It is the true body and blood of our Lord Jesus Christ under the bread and wine. Go on to the next frame.

(27) It, the, body, and, blood, Jesus, bread, and, wine, eat, drink, by, Christ

28. What is the Sacrament of the Altar? ___ true _______ ____ ___ our ____ _______ under ___ ____ ___ for _______ ___ and ____, instituted _______ _______.

(34) in remembrance of me

35. The Sacrament of the Altar is a special occasion for us to ___ Jesus.

Go on to the next frame.

43. The Sacrament of the Altar is a joyful celebration for us Christians and we give thanks to God. For that reason the Sacrament has also been called by the Greek name which means a "giving of thanks". That name is ________.
5. In the Bible we learn about something else which God has given us to make us stronger Christians. This extra source of strength was first given to the disciples by ____ on the night before He died.

13. We believe Jesus really gives us His body and blood because we believe the words which He spoke to His disciples. Write these words. "Take, eat, ____ — ____." "Take, drink, ____ ____ ____.

21. Jesus instituted (first gave) us the Sacrament of the Altar at the meal which He ate with His disciples.

29. What is the Sacrament of the Altar?
   — — — — — — — — — —
   for — — — — — — — — — — — —
   instituted — — — — — — — — — — — —

36. When we remember Jesus we also remember why He lived, died, and rose again from the ____.

44. Holy Communion, or simply Communion, is another name for the celebration we call the ______ Altar, the Lord's _____, or the ______.
6. The name of the extra source of strength which Jesus gave His disciples and us is the Sacrament of the Altar. Write the name of the extra source of strength which Jesus has given us.

14. We believe that Jesus' own body and blood are present with the ___ and ___ in a real way.

22. What is the Sacrament of the Altar? It is the true body and blood of our Lord Jesus Christ under the ___ and ___, instituted by Christ Himself.

30. What is the Sacrament of the Altar?

37. We remember that we daily sin much against ___.
7. Jesus was eating the Passover meal with His disciples when He gave us the ________ ______ ______.

15. If we believe Christ's body and blood are really present with the bread and wine we believe in the R ______ Presence.

23. Jesus said, "Take, __, this is my body," and, "Take, __, this is my blood."

31. What is the Sacrament of the Altar? ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________

38. We remember that we can have forgiveness of sins only because of _____.

46. Write four names for the celebration in which Jesus gives us His body and blood in, with, and under the bread and wine.
   ___________________________; __________________________;
   ___________________________; __________________________;
(7) Sacrament of the Altar (Passover is not the same as the Sacrament of the Altar.)

8. During the Passover meal Jesus gave thanks, took bread and wine, and gave them to His ________.

(15) Real

16. If someone believes that the bread and wine are only symbols of Christ's body and blood, or that they represent Christ's body and blood, does that person believe in the Real Presence? Yes or No. ________

(23) eat drink

24. God gave us Christians the Sacrament of the Altar to eat and drink for strengthening our faith when it has become _____.

(31) It is the true body and blood of our Lord Jesus Christ under the bread and wine, for us Christians to eat and to drink, instituted by Christ Himself.

(38) Jesus

39. What does the Bible say we do when we "eat the bread and drink the cup"? See I Corinthians 11:26. "we __________ until He comes." (Use the Revised Standard Version of the Bible.)

(46) Sacrament of the Altar, Lord's Supper, Holy Communion, Eucharist

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