



## PROGRAMMED INSTRUCTION AS A TEACHING STRATEGY.

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### ABSTRACT:

Programmed instruction was developed to make the teaching-learning process more effective and custom-made according to individual differences. Knowledge advancement and innovative practices is intricately related with developing new abilities to learn. Programmed learning-teaching process deals with adopting suitable instructional design for providing the learner with experiences and organizing teacher pupil activities which is essential for effective use of curricular content and achievement of curricular objectives. It is important for every teacher not only to have mastery of the subject she teaches but also to know how to use various types of instructional design and aids that facilitate the teaching-learning process optimally. This paper discusses the meaning, principles of programmed instructions, development of programmed instructional material in teaching, styles of programmed instructions (namely branched programme, linear programme, mathematics programme), the advantages / disadvantages of programmed instructions and suggestions for use of this strategy as an effective pedagogy.

### KEYWORDS:

PROGRAMMED INSTRUCTION BRANCHED PROGRAMME, LINEAR PROGRAMME, MATHEMATICS PROGRAMME.

Programmed Instruction method of teaching is an individualised strategy focussing to bring desirable change in the cognitive domain of the learner's behaviour. Programmed learning is a systematically planned, empirically established and effectively controlled technique for providing individualized instruction to the learner through logically sequenced small segments of the subject matter by using the principles of operant conditioning and schedules of reinforcement. Programmed instruction / learning simply means learning performed or instruction provided by a teaching machine or programmed textbooks.

Several scholars have defined programmed instruction in various ways. Smith and Moore (1962) defined programmed instruction as the process of arranging the material to be learned into a series of sequential steps, usually it moves the students from a familiar background into a complex and new set of concepts, principles and understanding. According to Leith (1966), programmed instructions is a sequence of small steps of instructional material (called frames), most of which require a response to be made by completing a blank space in a sentence. To ensure that expected responses are given, a system of queuing is applied and each response is verified by the provision of immediate knowledge of result. Such a sequence is intended to be worked at the learners own pace as individualized self instruction. Espich and Williams (1967) defined programmed instruction as a planned sequence of experiences, leading to proficiency in terms of stimulus responses relationship, that have proven to be effective.

### FUNDAMENTAL PRINCIPLES OF PROGRAMMED INSTRUCTION IN TEACHING

There are certain basic fundamental principles governing the programmed instruction method of teaching. Firstly, the 'Principle of Small Steps' is based on the assumption that a person learns better if the content matter is presented to him in suitable small steps. Thus, the programmer or teacher arranges the subject matter into a properly sequenced and meaningful segment of information called frames. These segments are presented one at a time before the learner for responding. Secondly, the 'Principle of Active Responding' refers to a good program which actively involves the learner in the learning process in such a way that the learner may not feel much difficulty in moving from one frame to another. Active responding to the frame leads to acquiring the knowledge step by step in a smooth manner. Thirdly, the 'Principle of Immediate Reinforcement' follows whereby appropriate consideration is made for the provision of immediate reinforcement by informing the learner about the correctness of his response. This motivates the learner to learn further. Fourthly, the 'Principle of Self-Pacing' is based on the principle of individual difference wherein the learner is able to respond and move from one frame to another according to his own speed of learning. Finally, the 'Principle of Student-Testing' is incorporated for better learning and thus continuous evaluation of the learning process is required. In programmed learning, the learner is required to write a response for each frame on a response sheet which is recorded. The detailed record helps in revising the programme.

## DEVELOPMENT OF PROGRAMMED INSTRUCTION MATERIAL IN TEACHING

Development of programmed instruction material in teaching involves three phase's namely preparatory, development and evaluation phase. The 'Preparatory Phase' has several sub-steps which are to be followed by the programmer or teacher systematically. The teacher needs to first 'select the topic or units' wisely that needs to be programmed based on the following criteria's like 'Is any program already available on the topics? Can it be conveniently taught by other available methods?', 'Does it allow developing a simple, logical and systematic program which is quite interesting, useful and suitable from the angle of the learner?', 'Does it meet the curriculum needs of the learner?', 'Does it allow for setting the real and useful objectives in behavioural terms and can a criterion test be developed to measure the outcomes of the results of the programmed learning?', 'Will the labour and expenses incurred in the development of the program be justifiable in terms of the gains?'. Secondly the programmer or teacher needs to 'write assumptions about learners'. Since the programme is meant for the learners, the programmer or teacher should know and describe the characteristics of the learners in terms of their age, gender, socio-economic-cultural background, intellectual level, interest, scholastic abilities, aptitudes, previous knowledge, potential of learning, etc. For this purpose the programmer or teacher can take help of cumulative record cards, achievement tests, aptitude tests, intelligence tests, interest inventories, diagnostic tests etc. Thirdly, the programmer or teacher should 'write the objectives of the lesson or subject matter to be taught in behavioural terms'. Thus, after knowing about the potentiality of the learners, the programmer or teacher has to set the definite instructional objectives based on the cognitive, affective and conative domains. These objectives should be stated clearly in behavioural terms regarding the type and extent of the behavioural changes to be expected from the learners after going through the programme. Thereafter the programmer or teacher should 'list the entry behaviour of the learners or students' which refers to the pre-requisite knowledge, attitudes or skills which the learner already has that is relevant to the next level of task or subject matter to be learnt. After the above steps have been completed, the programmer or teacher should 'develop specific outlines of content matter of teaching'. The course contents to be covered through the programme are decided on the basis of basic assumptions about the learners, their entry behaviour, objectives to be realized in the form of terminal behaviour, and the courses of study prescribed to them by authorities like Boards of School Education and University etc. The programmer or teacher must try to organize the contents in such a way that it can suit both the purposes, i.e. logical and systematic treatment of the subject based on the psychological requirements of the learner. Finally, at the planning stage, the programmer or teacher has to 'develop a criterion test' to be administered at the completion of the programme for

measuring its effectiveness in relation to the realization of the specific instructional objectives. Criterion Test is meant to measure the achievement of a student examinee on a certain domain to find out his level of achievement in that domain. It has nothing to do with the achievement level of other examinees (that is the learner's rank within a group of learners). The criterion test is prepared by keeping the following in mind namely instructional objectives, construction of objective test items based on item analysis and establishing the reliability and validity of the test.

The second major step of development of programmed instruction material in teaching involves the 'Development Phase'. The development phase covers the actual writing of the programme. While writing the programme, the programmer or teacher takes help from what is being done at the preparatory phase. The assumptions about the learner, his entry behaviour, the instructional objectives fixed in the form of terminal behaviour, the outlines of the contents chosen, particular programme style to be adopted etc. all are given due consideration while engaging in the writing programme. In the development phase, firstly the programmer or teacher has to select the 'designing of the frames'. A frame represents the basic smallest unit of the instructional material that is to be presented to the learner at a time. It varies in size from a few words to a full page or more. Secondly, the teacher programmer has to 'sequence the frames' which refers to the task of arranging the frames in some systematic order (on the basis of logical and psychological principles) to lead a learner from his entry behaviour to terminal behaviour. Finally, the teacher programmer has to engage in 'editing of the program'. The first draft of the programme developed in the form of sequenced frames is subjected to a thorough review and editing process. This work is done in the following three ways namely, technical accuracy editing which means to remove errors pertaining to timetables, teaching-aids, infra-structure etc., programme technique editing which means to remove errors relating to design, sequencing of frames, styles, formats etc. and composition editing which means to remove errors relating to language like grammar, spelling, punctuation etc.

The last phase of the development of the programmed instruction material in teaching is the 'Evaluative Phase', which is related with the try-out and evaluation of the edited programmed material available in the form of sequenced frame. With the help of activities undertaken in this phase, the programmer or teacher tries to test the efficiency and effectiveness of his/her programme in the light of its results and he/she further tries to bring proper modification and improvement in his/her programme. The main activities undertaken in this phase are divided into four parts. The first part is 'individual try-out' where the programme is administered to a few learners, say four (representatives of whom the programme is written) by taking them out at a time. Second part is 'small group try out' whereby the modified programmed instruction draft (on the basis of the individual try-out) is then tried on a

small group of learners, say five to ten. Here, with a proper rapport and in an informal environment, the learners are persuaded to render proper help in testing the appropriateness and effectiveness of the programme. The third part involves 'field try-out or testing' in which on the basis of the findings of the small group try-out, the programmer or the teacher brings necessary structural changes in the programmed draft and goes a step further for testing its validity in the field. i.e. real setting. Field testing differs from the small group try out in the sense that it represents a full and final try-out of the programme and is undertaken by the teachers or instructors instead of the programmer with the real students in real learning situations. Finally, 'evaluation' of the entire programmed instructions is done. The results of field try out in the form of data are properly analyzed through the process of evaluation for testing the validity and improving the quality of the prepared programme. This validation is carried out on two fronts; one on internal criteria and the other on external criteria. The internal criterion of the evaluation is concerned with internal features, strength and weaknesses of the programme whereas the external criterion provides support for the validation of the programme by giving evidence in favour of its effectiveness.

### STYLES OF PROGRAMMED INSTRUCTION METHOD OF TEACHING

Various styles of programmed learning instructions have been invented, however linear programming, branching programming, and mathematics programming are most common in the field of teaching-learning. Linear programme is one in which every learner follows the identical sequence, that is, the frames are encountered in a single, pre-arranged order. The proponent of this type of programme style is B.E Skinner (1959). Branching programme is one where the particular response emitted on a frame determines the alternative frame/ frames, before the learner proceeds to next. The proponent of this

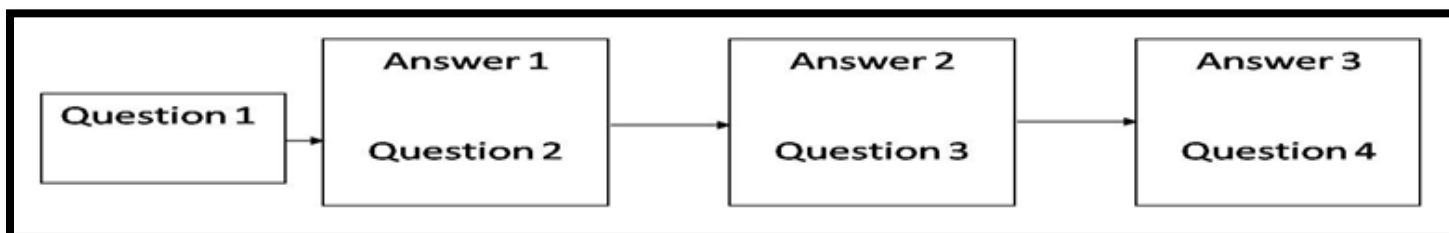
programme type is Norman Crowder (1960). Mathematics is one in which there is the systematic application of reinforcement theory to the analysis and construction of complex repertoires. This also represents mastery of subject matter. In it, the behaviour is generally classified as involving discrimination, generalization, and chaining. This style is considered to be an extension of the linear model of programming. The exponent of this style is Thomas E Gilbert (1962).

### LINEAR PROGRAMMING

Linear programming refers to the Operant Conditioning Model of Teaching of Skinner (1955) which is based on the assumption that human behaviour can be shaped or conditioned gradually, step by step, with suitable reinforcement for each desired response. Consequently, in this programming, the instructional material is sequenced into a number of meaningful small steps, called frames. These frames are presented to the learner in the arranged sequence, one at a time. The learner is required to respond actively at each step. Immediately after responding, the learner is given information about the correctness of the response. It reinforces his behaviour and he may be motivated to learn the next frame in the arranged sequence. By proceeding from one step to another, the learner may be able to acquire the desired learning experiences.

The sequence of frames and path of learning in this programmed learning is systematic and linear. Here all learners are to proceed through the same frames and in the same order. The whole instructional process is well controlled. If the learner does not respond correctly to a particular frame, he may be required to either repeat the frame or be acquainted with the correct response. The learner is not allowed to move to the next frame unless he responds correctly to the present frame. Thus the student proceeds on his self-learning path by going from one frame to another in a sequential and systematic way.

### LINEAR PROGRAMMING MAP



### BRANCHING PROGRAMMING

Crowder's approach (1954) is based on the psychology of Individual Differences. Branching Programming employs multiple choice response pattern. A student is required to discriminate and choose the right answer which is presented along with a number of other plausible but incorrect answers. The assumption is that a wrong response does not necessarily hinder in learning of a correct response. Branching Programming is also termed

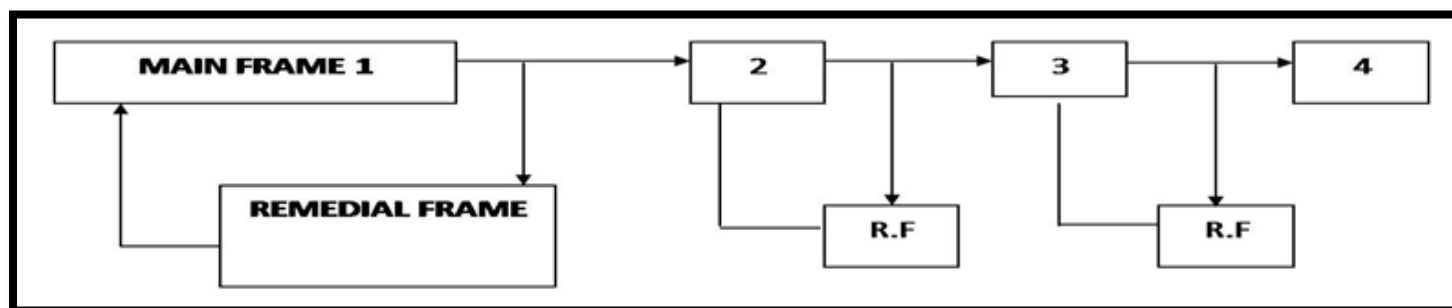
as Intrinsic Programming. The word, 'intrinsic' is used as the student's response is controlled by himself internally.

The Procedure of Branching Programme follows four steps. First, the instructional material divided into units or 'frames' are of one or two paragraphs or even a page. Thus, such a frame is quite larger than that employed in linear programming. Secondly, the learner goes through the frame and is required to respond to multiple choice questions associated with the learning material of the

frame. He has to discriminate and choose one right answer. Third, the learner moves forward if he answers correctly, but is diverted (branched) to one or more remedial frames if he does not. These frames explain the matter afresh, asks

him questions to elicit the right answer and reveals his previous mistakes, and then returns him to the original frame. Finally, the cycle goes on till the learner passes through the whole instructional material at his own pace.

### BRANCHING PROGRAMMING MAP



### MATHEMATICS PROGRAMMING

The founder of Mathematics is Thomas F. Gilbert (1961). "Mathematics is defined as a systematic application of reinforcement theory to the analysis and construction of complex repertoires which represent the mastery in subject matter." It is based on connectivist theory of learning. It is a reverse chaining approach. It is based on Principle of chaining, discrimination and generalization. Mathematics programming is based on following assumptions namely chaining of responses helps in learning to reach up to mastery level, reverse chaining of stimuli helps in learning, i.e. from whole to part, from complex to simple and lastly completion of task provides motivation to students. In the Mathematics style of programmed instructions, frames size is organized in small step but in a reverse chain i.e. from complex content to its small, simple units to attain mastery level. Frame structure is based on demonstration-prompts-release. There are two types of frames- 1. Demonstration frames 2. Prescription frames.

Responses are structured responses and responses are determined by the programmer. Completion of task provides reinforcement. Wrong responses are ignored. Error helps in discrimination but not in learning. Its main purpose is to develop mastery of the content. It used for higher classes useful for complex and difficult task. It is useful for developing concepts of mathematics and grammar.

### ADVANTAGES AND APPLICATIONS OF PROGRAMMED INSTRUCTIONS

Programmed learning may prove immensely useful to the students, teachers and educational administrators. Programmed learning helps in individualizing the instructional process. The scope of self-pacing gives opportunity to the students for learning according to their own speed without obstructing the path of others. It provides feeding material to the self-instructional devices such as computer, teaching machine, and programmed text. Such devices help the students in the task of self-learning, solve the problem of paying individual attention, solve the problem of scarcity of trained and

effective teachers and help in revolutionizing, developing and providing the techniques of self and mass-education. The social setting of the classroom may be properly improved and the problem of discipline gets solved automatically with the help of programmed instruction.

Programmed instructions is an effective teaching strategy as the content may be thoroughly analyzed and presented in suitable steps and logical sequences, and where the instructional objectives are properly set. Reinforcement and feedback are properly provided, the learner gets opportunity for self-learning and initiating his response, the learner gets proper opportunity for self-assessment of his performance; the learner is actively involved in the task of learning. It also provides the learner sufficient motivation and interest etc. Programmed instructions proves useful in the enrichment of curriculum and thereby, in the education of the exceptional children. It may be effectively used in providing guidance and remedial instruction. It helps in the development of interrogative, judgemental and creative learning. The power of discrimination and making immediate and effective response is developed through such programmed instruction.

### DISADVANTAGES OF PROGRAMMED INSTRUCTION

However there are certain disadvantages of programmed instruction. In absence of the teacher, students may spoil the disciplinary tone of the class, or they may be helpless when any problem arises. With use of programmed instructions, only cognitive objectives can be achieved. There is no chance for students' creativity as their responses are highly structured. Programmed Instruction done on an individual basis at student's home would likely have to be limited to the linear type. While this could be effective, it may not have the potential that more sophisticated computers would have. The preparation of programmed instruction material is time demanding, many hours are usually required to produce a unit. The technique may be new to the many students and they may not complete units satisfactorily because

they may not adequately understand the concept of programmed instruction.

### **SUGGESTION FOR THIS TEACHING STRATEGY**

For the programmed instruction method of teaching to be successful, a programmer or teacher should have thorough knowledge of the content and technique of content analysis. This strategy should be used as a supplementary device for remedial teaching in the class room. A wide variety of media or display devices can be employed to deliver the programs more effectively. It should be used in distance education or continuing education programs where no rigid time table is applied. If applied in classroom teaching, the programmer or teacher should be present in the class. This will help him/her to maintain discipline in the class and help in eradicating the difficulties of the learners. Moreover, personal touch and individualized attention of the teacher can be more fruitful and effective in student's learning.

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