DEVELOPING CURRICULUM FOR TECHNICIAN COURSES - A SYSTEMS APPROCH

★ P.D. Kulkarni

★★ M.M. Malhotra

***Note** : Paper read at ISTE Seminar on 'Curriculum Development' held in December,1974 at Hyderabad. The paper is reprinted as the basic process of Curriculum Development is presented in the paper which is applicable even today.*

At all levels in the field of education, it is becoming increasingly apparent to scientifically oriented educators that educationists should discard their folk-lore approch to education. Within the educational context, the goals of education methods and media of communication, evaluation etc. should, in fact, be organised into a unified instructional system striving to attain the prescribed goals of education. This, in the broadest possiblle terms, is called the system's approach to education. The systems approach to education views the entire instructional system as an organismic system. The basis of this organismic concept is that a living organism is not simply a collection of separate limbs, senses or elements but an integrated system possessing organisation and wholeness. The elements of the organism receive stimulii from the environment and perform their acts under the central direction of the brain, which determines the objectives or the purpose of the system co-ordinate, contribute and interact with one another. On the same lines, the instructional system for any technician course can also b e viewed as an organismic one. The elements of the system are : Public, Industry, State Board of Technical Education, Polytechnic administrators, Polytechnic teachers, specialists, learners, instructional programme and media, instructional procedures, instructional resources and evalution procedures All these elements are performing their acts to achieve the goals of technician education.

The purpose of education is to bring about the desirable changes in the ways a person thinks, feels and acts. The desirabe changes to be brought about are decided by the public, Industry, administration and specialists. How to bring about the change is decided by the administrators, specialists and teachers in the form of instructional programme. Teachers decide in the class rooms, what acts should be performed (Instructional objectives) with what these could be performed (Instructional media) and how these could be done (instructional procedures). The educational objectives can be achieved only when there is a true interaction between the learner, teacher, administrator and the Industry. The instructional system which has to achieve

★ Former Principal T.T.T.I.,Chandigarh and now Educational Consultant at Pune

★ Presently, Principal T.T.T.I. Chandigarh

some defined aims requires a throrough and continuous consideration of the inter-connecting components of the system and their inter relationship. A change in one component may affect a change in the other components of the system or in the system itself.

Stages of Curriculum Development :

Development of a purposeful integrated system has to undergo three stages of development.

I) Design stage
II) Development stage
III) Evaluation stage.

To develope a plan of system for the curriculum development of any technician course, it would be important first to identify the various elements of this system and recognise the relationship among these elements. The system has been represented by a model which shows various steps involved in curriculum development. The scope of this paper is limited only to the design stage of the curriculum development and therefore the steps involved in this stage are discussed. For illustrating these steps, examples have been taken from the curriculum of post-diploma course in Building Technology and Valuation, designed recently. A schematic diagram showing the steps involved and their inter relations is shown in Fig-1.

1. Conducting Job/Market Survey Listing possible job opportunities and activites under each Job :

There are five methods of arriving at the overall objectives of any educational system, viz :

a) Acceptance of authority procedure
b) Scientific and analytical procedure
c) Social function of living procedure
d) Persistent life situation procedure
e) Adolescent needs and problems procedure.

Since most of the technician courses are meant to train students for specific jobs, the scientific and analytical procedure suits such courses. In this, it is assumed that the education is to prepare men and women for the activities of every kind which makes up a well rounded adult life. Having found the activities, the job of the Institution is to teach the students to perform them. Activities of the adult life are the specific objectives of the curriculum and the activities by which the students learn to perform them come under the domain of curriculum. On the basis of this philosophy, a Job survey is first conducted to assess the various job opportunities of employment for the technician and also the likely activities to be performed under each job opportunity. The acitvities are listed in terms of the observable performance. For illustration, one of the job opportunities and activities under it for a technician in Building Technology and Valuation will be :

Job Opportunity - As Assistant to a Valuer
Activities -

i) Conduct survey of properties
ii) Prepare/scrutinise drawings of the property.
ii) Select method of valuation.
iv) Calculate replacement cost of property.
v) Calculate depreciation.
vi) Determine market value of land.
vii) Determine rates of interest and conduct survey of rental return.
viii) Valuate property on the basis of rental return.
ix) Conduct survey to determine the applicability of the development method of valuation.
x) Collect details required for valuation by development method.
xi) Collect details for properties which are lease hold or mortgaged.

2. Determning course objectives from the activity analysis in terms of knowledge, skill and attitudes.

Every act performed by a human being is the result of thinking, feeling and acting. The thinking is guided by the knowledge, feeling by the knowledge and attitude and the action by the knowledge, attitude and psychomotor skills. Each activity or the task can therefore be broken down into knowledge, attitudes and skills. The function of each Institution is to impart these knowledge, attitudes and skills, to the students to enable them to do the desired tasks. All the activities of a technician are thus analysed to find the requirement of knowledge, skills and attitude. For illustraton, one of the activities of a technician in Building Technology and valuation is analysed as under :

Activity	Knowledge	Skill
Prepare detailed estimates for building and work out quantities of individual items.	Knowledge of taking off different items of work from the drawings of the buildings	Skill in preparing bill of quantities for different items of work of a building & preparing material statement.

The requirement with regard to knowledge, skills and attitudes obtained by analysing activities is then summerised in the form of course objectives. Accordingly, one of the course objectves formulated for the course in Building Technology and Valuation was :

> 'After the completon of the course, the student must have acquired basic concepts of soil mechanics and skill in sub-surface exploration for determining bearing capacity of soil.'

3. Assessment of Entering Behaviour

In the selection of curriculam areas and their contents, it is very important first to assess the entering behaviour of the students to be admitted to the course. This is accomplished by s tudying in detail, the contents of the courses covered by the students and their average performance before entering the technician course for which the curriculum is being designed.

4. Selection of Curriculum Areas :

An Institution transfers the knowledge, skills and attitudes to the students through careful selection of curriculum areas or subjects. The content earns its place in the curriculum by its contribution to the achievement of course objectives. Any educational programme for technicians requires that a student of the course should not only train himself for specific jobs, but also must be able to deal effectively with future changes in technology. This means that a student not only should learn the necessary skills and techniques to perform jobs, but should also equip himself with fundamental concepts and principles related to that branch of Engineering to cope with future technological change.

While laying the course objectives, i t has to be stressed that the student should acquire basic concepts and principles of certain curriculum areas, and also the skills and techniques to do a particular job.

At all levels of technical education from the draftsman courses to the graduate courses, the degree to which basic concepts and principles are learnt and the acquisition of competencies for performance of jobs vary according to the importance, the course objectives give to each. At craftsman level, competencies for job performance are important than the acquisition of concepts and principles. At the graduate level, it is the basic structure of the knowledge that is more important than the job competencies. At

technicians level, both are important almost in equal proportion.

Basic concepts, principles and generalisations, form the structure of the organised body of the knowledge called disciplines. Grasping the structure of the subject is understanding it in a way that permits many other things to be related to it meaningfully. To learn the structure means to learn how basic concepts, principles and generalisations are related and how they define and give meaning and order to the discipline.

Furthermore, there are subjects which are non disciplinary in nature, in which the subject matter is organised around skills, techniques and problems essential for performing jobs efficiently.

At technician's training level, all basic concepts and principles which are common to the understanding and acquisition of skills and techniques of various jobs of a branch of Engineering should be taught through disciplines. The other subjects, non disciplinary in nature select contents which are related to the specific problems of the job. Essentially, however, the understanding of these subjects are based on the learning of the disciplinary subjects.

From the course objectives, therefore, curriculum areas are first broadly determined. For example, in designing curriculum for Building Technology and Valuaton, one of the course objectives formulated was :

> 'After the completion of the course, the students must acquire basic concepts of construction management, organisation of site, planning the progress of work, requisitioning and installation of machinery, tools and plants for excavation and hoisting.'

To achieve this objective, subjects on 'Construction Management, and 'Construction Methods and equipment' were included in the curriculum.

The next step is to classify these curriculum areas broadly into supporting subjects, disciplinary in nature and Engineering special ities, non disciplinary in nature. As an illustration of the foregoing discussion, in theBuilding Technology and Valuation course, the subjects classified into the first category were Building Planning and Bye laws, Building Construction and Design. Construction Materials and Construction Management. These are the basic subjects which equip the students with necessary concepts principles and generalisations required to solve problems in drawing, estimatng, valuation and site supervision. The remaining subjects such as construction draftng and modelling, quantity surveying, construction methods and equipment and valuation were basically the subjects whose contents were organised round problems arising in the building profession in design, drawing, estimatng, valuating and supervsion of work.

Once the disciplinary and non-disciplinary nature of the subject is known, it becomes easy for the curriculum worker to select course contents. This also helps the horizontal and vertical organisation of the curriculum areas.

5. Determining detailed content and approach to the subjects in respect of teaching, selection of resource materials, evaluation etc.

For the basic supporting subjects which are disciplinary, in nature, content is generally selected from the concepts, principles, generalisation etc. constituting the structure of the subject. It may include certain topics which may not be directly relevant to the problems of the specialization as indicated by the activity analysis, but since they form the part of the structure, they are included in the content. This consideration is, of course, not in the case of specialised subjects.

For the Engineering specialites, the content is determined from the activity analysis

and the problems stated in the course objectives.

In order to guide a teacher in understanding the basic approach to learning a subject or curriculum area, a teachers' note has to be prepared. Teachers 'Note explains the nature of the subject-Disciplinary or Non-Disciplinary, general approach to be adopted in teaching, and evaluating the subject and also the materials to be used both by the teachers as well as the students in the teaching and learning proces..'

6. Determining the time required for each curriculum area based on the maturational level of the student and his entering behaviour :

The vertical organisation of the curriculum provides for the unbroken and upward progressive learning with due recognition to the wide variability among learners, their maturational level and entering behaviour. Vertical organisation of the curriculum includes determination of time required to org anise learning in sequence so that one learning builds up the next one. While determinng the time, following points will be taken into account.

1) Nature of the subject.
2) Difficulty level of the subject matter, with relation to the student's maturity and entering behaviour.

It is a matter of day to day observation that younger students learn practical skills earlier than the older ones. But during the cognitive development, younger students who have yet to develope adequate contact with the physical world and whose stock of concrete experiences is limited,...would take longer time to learn abstract ideas and concepts. Similarly, subjects which are full of abstract ideas and principles take longer time to understand than the subjects which deal more with the physical world. This is a step where subject matter specialists its and educationists should work together.

In designing the post-diploma course in Building Technology and Valuation, the time requirement for each subject was calculated after taking into consideration that the en trants to this course were basically diploma holders and have come in contact with Engineeering subjects and construction already.

7. Listing the constraints for the course :

This is a step towards the structural design of the curriculum. Following elements constitute the Frame work of any educational programme.

i) System - Annual/Semester/quarterly.
ii) Duration of course
iii) Course pattern-regular/sandwitch
iv) Number of classes and No. of students in each class
v) Minimum Entrance qualification.

Normally the curriculum worker has no control on all the above factors. System of the educational programme might be Annual, Semester or quarterly as laid down by the Board of Technical Education of a State. Duration of the course has to confirm to the general pattern of Education. Number of the students for a course has to conform with the popular demand. Number of classes and the students in each class of lectures, tutorials or practicals is again laid down. Entrance qualification, most of the time, is predetermined by the general Educational pattern. All such elements, over which the curriculum framer has no control, are called constraints. These constraints have, therefore to be looked into at the various stages of the design of a curriculum as explained in the later steps.

8. Determination of the effective time for the given duration of the course :

Since the duration of the course and the

course pattern is one of the constraints, it is necessary to find out the effective time available for study in the institution as well as for the Industrial Training, if any. This is done by making the allowance for the holidays, leave preoaratory to examination, examination and project. The effective time thus calculated is compared with the actual time required for the study of the contents as worked out under step 6. In case there is a disagreement, the course objectives and thus the contents will be revised.

REFERENCES :

1. Bobbit, "Curriculu for Modern Education."
2. Krug, "Curriculum Planning", Harper.
3. Neagley & Evans, "Handbook of Effective curriculum Development", Prontico Hall.
4. Alberty, 'Reorganising the High School Curriculum", MacMillan.
5. Saylors & Alexander, "Curriculum Planning", Holt Rheinhare.
6. Wood,"Foundation of Curriculum Planning and Development", American and Nepal Educational Foundation.
7. Natonal Education Associaton of America, Weshigton, "School for Sixties".
8. Sattler,"History of Instructonal Technology", McGraw Hill.
9. Brunner,"Process of Education", Harvard University Press.
10. H.Taba,"Curriculum Development Theory and Practice", Harcoart Braco & World.
11. M-M.Malhdra,"Development of Curriculum for Diploma in Building Technology", Commonwealth Key Bursars Association, News Letter, 1972.
12. P.D.Kulkarni, "Curriculum Development an proparation of Instructional Materials for Polytechnics. Proceedngs of the Seminar on Technical Education, February, 20-23 1971, Ministry of Education and Youth Services, Government of India.

■

A SCHEMATIC APPROACH TO CURRICULUM DEVELOPMENT

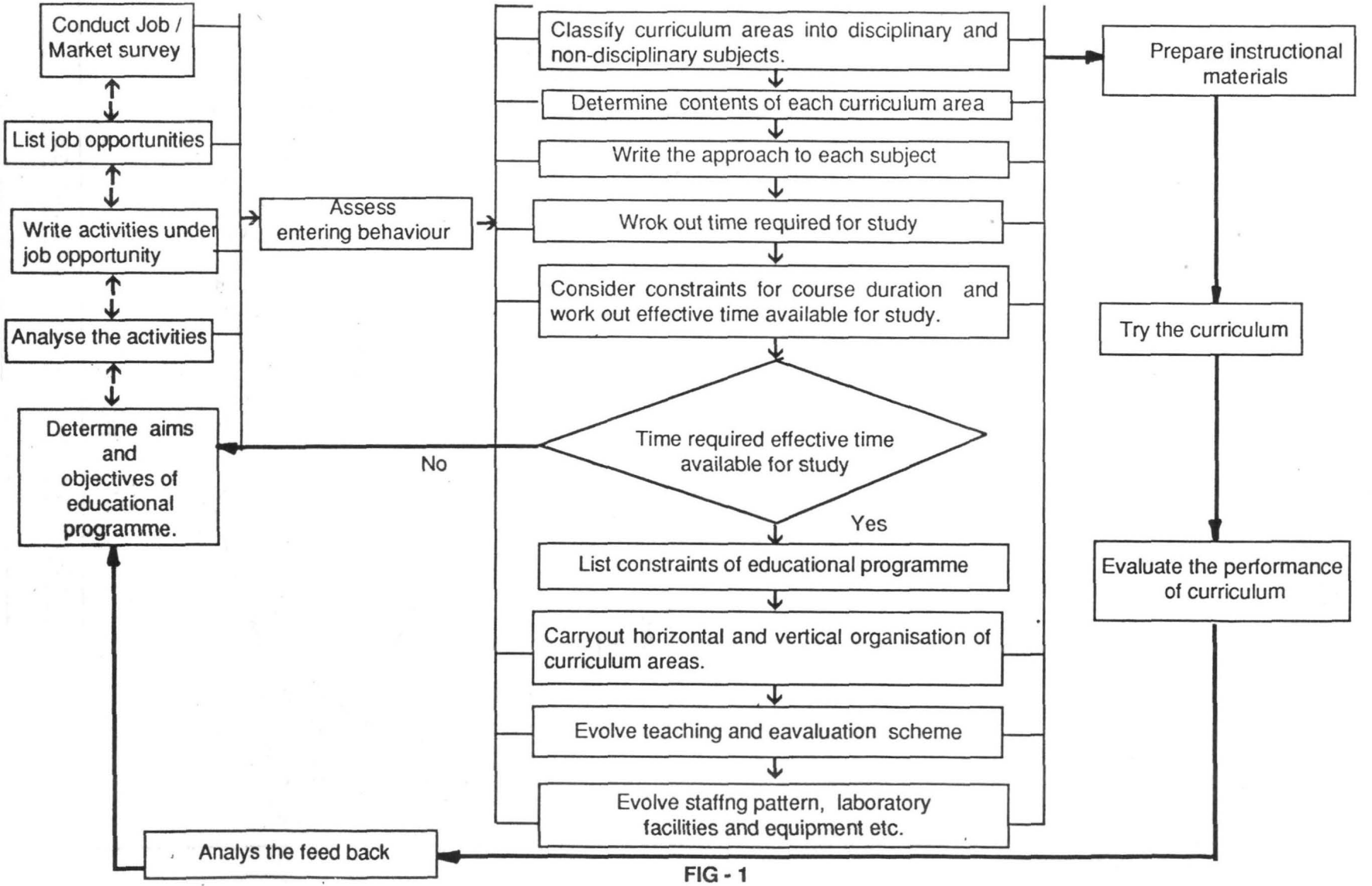

FIG - 1