

METHODS OF TEACHING SCIENCE, BASIC TECHNOLOGY AND COMPUTER STUDIES



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CHAPTER 8

SOME METHODS OF TEACHING MATHEMATICS II

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Objectives

After reading through this chapter, students should be able to:

- (i) Define Lecture-Method, Cooperative and Collaboration Method, and Individualized Project;
- (ii) Describe and explain advantages and limitations of Cooperative and Collaboration method; and,
- (iii) Explain the application of Lecture-Method.

Introduction

The contents of mathematics are sequenced and patterned to encourage precise, logical, critical thinking, computational skills, and develop the ability to recognize and solve problem among learners. Thus, mathematics is a set of interrelated, abstract and symbolic systems. The peculiar language and symbolism of mathematics distinguish it from many other subjects. As such, meaningful presentation of mathematical ideas (transfer of knowledge / experience) is as important as mastery of the subject matter. It implies that, what students learn in mathematics classroom depends not only on the curriculum, teachers' characteristics, their own characteristics, and environment, but also on the way (how) in which contents are taught to students.

The art of HOW refers to ways of facilitating learning, sustaining interest and acquiring the knowledge. This has generated arguments among scholars and different methods considered suitable have been proposed. The central focus is, however, to penetrate all human endeavours with mathematics idea via renewal of old and, or adoption of new teaching strategies that can accommodate prevailing learning situation across the globe.

Specifically, this chapter describes features, uses, advantages and limitations of some commonly used methods. Three of them are discussed separately or in combinations: ¹Lecture-Discussion Method, ²Cooperative and Collaboration Method and ³Individual Project.

Lecture-Discussion Method

What is lecture method? This method is one of several teaching methods. The word *lecture* has its origin from the latin word *lectus* in the 14th century and became popular in the 16th century. *Lectus* which was translated to mean 'to read' was then used to describe oral instruction given by a teacher in front of an audience of learners. In this context, lecture method refers to method of providing knowledge or transfer of learning experience through a speech. This method of teaching is one way channel of information communication. Lectures are literally just long-winded explanations of information, deemed important by the teacher and mostly effortless

on the part of the students, who need only pay attention during the lecture and take notes where necessary.

The type of teaching-learning process that allows sharing of ideas, views and togetherness in problem solving is known as Discussion method. Either the teacher or student can provide a lead. When led by the student, supervision should be provided by the teacher. Though the two, Lecture and Discussion methods can stand separately but may not be effective in mathematics classroom when used independently. The combination, which is based on three sources, namely: Schemata theory, meaningful verbal learning and active learner involvement is therefore recommended. Schemata theory uses what students already know by building on their existing background; meaningful verbal learning deals with information presentation in a systematic way while active learner involvement uses teacher questioning to involve students actively in learning processes. The interrelationship between lecture-discussion is depicted in figure that follows.

Level	Instructional Level/Event	Internal Mental Process
1	Gain Attention	Stimuli activates receptors
2	Inform learners of lesson objectives	Creates level of expectation for learning
3	Provide lesson guidance	Semantic encoding for long-term memory
4	Present the content	Selective perception of content
5	Elicit Performance (practise)	Enhancing encoding and verification
6	Provide feedback	Reinforcement and assessment of correct performance
7	Assess Performance	Retrieval and reinforcement of content as final evaluation

Fig 1: Application of Lecture-Discussion Method
Source: Maths MS- MH Teaching strategies. pdf (Modified)

Advantages

1. Lecture-Discussion method is convenient and usually makes the most sense, especially with larger classroom sizes.
2. Students can absorb large quantities of new material.
3. Requires little input from students because it's the most clear, straightforward, and uncomplicated way to expose students to large quantities of information.

Limitations

1. Attention level is not the same among the students and learners focus may be easily shifted.
2. The type of learning available is informative learning where learning or transfer of knowledge to students is solely from a person assumed to have a greater knowledge /experience (teacher/ educator). Hence, the method does not promote active learning process.
3. Individual differences are not recognized and considered by the teacher.

Cooperative and Collaboration Method

In mathematics, there is wide opportunity for team work. It is meant to aid better understanding, homogeneity of group in terms of intelligence and level of achievement. As the name suggests, cooperative and collaboration method is a combination of two separate teaching-learning modes which when harnessed can improve student learning in mathematics.

What is cooperative learning? Is a specific kind of group learning where students work together on structured activity. Cooperating groups work face to face and learn to work as a team. The students are, however for the purpose of assessment, are individually accountable for their work.

In the case of *collaborative learning*, it is a method of teaching and learning where students work together to explore a significant question or a complex knowledge.

The paradigm shift for departure from traditional teaching methods, which are primarily teacher-centered and students-centered learning environment necessitated the birth of cooperative and collaboration method of teaching. Several models such as Jigsaw puzzle and think-pair share are components of cooperative and collaborative teaching mode. The emphasis, unlike traditional or one mode teaching methods, are on **socialization** (sharing information between individuals), **externalization** (expression of tacit knowledge into comprehensible forms that can be understood by others), **combination** (conversion of explicit knowledge into more complex sets of explicit knowledge) and **internalization** (newly created knowledge from explicit knowledge converted into organization's tacit knowledge). The features of cooperative and collaboration method are shown in Figure 2.

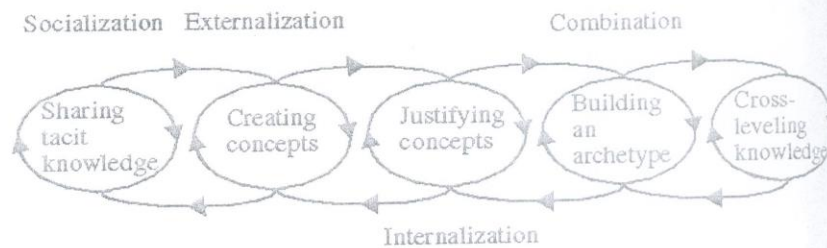


Fig. 2. Five-phase Model of the Organizational Knowledge-Creation Process (Nonaka & Takeuchi, 1995, p. 84)

Advantages

1. It stimulates learners' ability to present mathematical arguments and the conclusions from them with clarity and accuracy and in forms that are suitable for the audiences being addressed, both orally and in writing.
2. It develops the knowledge of teaching and learning processes in mathematics.

Limitations

1. If not properly harnessed, lazy students may consider it as a cover up
2. It leads to time wastage

Individualized Project

This is a medium of instruction was introduced during the 18th century into schools of Architecture and Engineering in Europe. Graduating students had to apply the skills and knowledge they had learned in the course of their studies to practical problems, such as designing of monument, and building a steam engine. By 20th Century, William Kilpatrick expanded individualized project into philosophy of education.

According to Knoll (1997), Kilpatrick devised four classes of projects for the method: construction (such as writing play); enjoyment (experiencing concert); problem (discussing complex mathematical problem like trigonometry and geometry); and specific learning (learning of skills such as swimming). Unlike traditional education, proponents of individualized project method attempt to allow the student to solve problems with little guidance from the teacher. Basic principles guiding individualized project are: (1) Psychological principles of Learning and (2) Psychological Laws of learning.

Psychological principles of Learning delves on (1) learning by doing (2) Learning by Living and, (3) Children learn better through association, co-operation and activity while *Psychological Laws of learning* has to do with (1) Law of readiness (2) Law of exercise and (3) Law of effect

Advantages

1. It develops self-confidence and self-discipline among students
2. It develops discovery attitude in the child
3. It promotes habits of critical thinking and encourages the students to adopt problem-solving methods
4. It provide score for independent work and individual development

Limitations

1. It is not economical
2. Textbooks and instructional materials are hardly available.
3. The knowledge is not acquired in a sequential and systematic manner

Revision Questions

1. What do you understand by Lecture-Discussion Method?
2. With the aid of diagram, explain the application of lecture-discussion method.
3. List and explain emphasis of Cooperative and Collaboration method.
4. Write short notes on the guiding principles of individualized project.

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