

Teaching and Learning of Technical Subjects in An ODL Environment

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Introduction

- **Teaching and Learning of science and technical subjects worldwide is facing a serious problem due to continuous decline in students' knowledge.**
- **An effective solution can be found using teaching and learning strategies that are based on constructivism theories.**
- **Active learning strategies incorporated in self-instructional material in most ODL institutions encourage learners to think and construct knowledge as they read at their own pace.**

Sequence of Presentation

This paper will highlight:

- Pedagogical Aspects
- Visualisation Mode
- ICT influence
- Future Research

Pedagogical Aspect

- In the context of S&T, Constructivist Theory which is based on the learning approach where the ability of learners to actively build new knowledge based on their current and previous experiences and knowledge is highly relevant. Learning should also include social and cultural aspects. Learning should engage learners in activities and realistic situations. Communication, interaction and sharing of knowledge with other learners is the expected outcome from this learning framework. It emphasizes active learning.

(Bruner, 1966).

PEDAGOGICAL ASPECT

Development of Learning Material should:

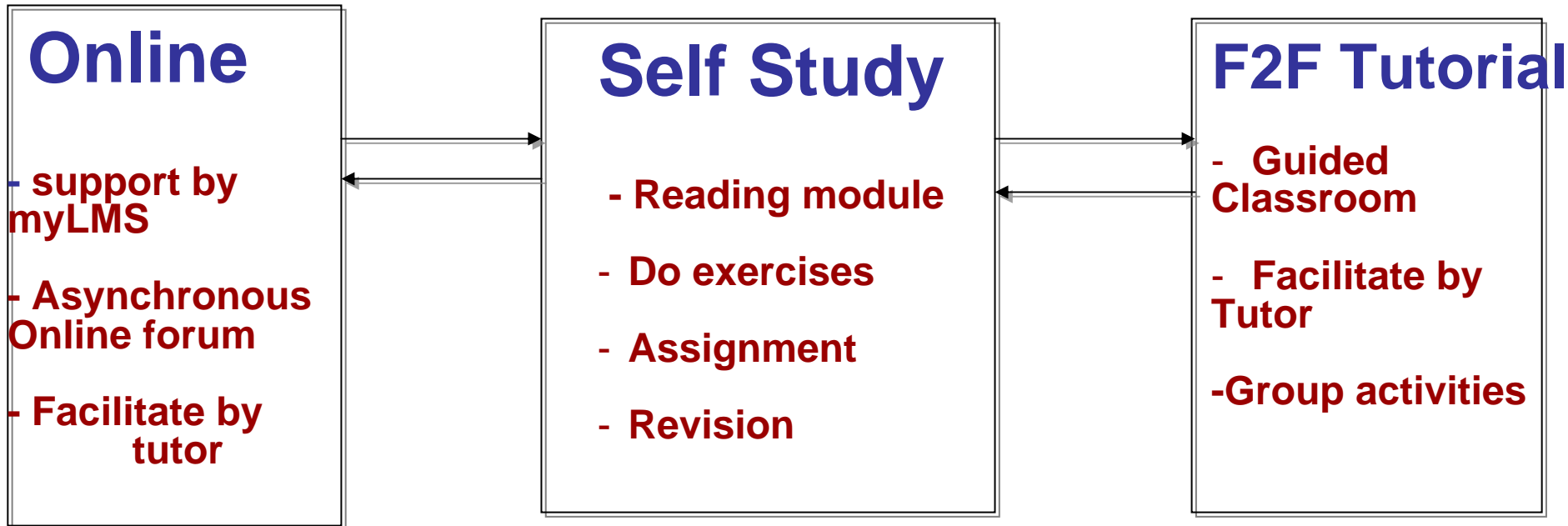
- engage learners in activities that require learners to construct knowledge by assimilating their prior knowledge and new knowledge.
- engage learners in activities involving realistic situations.
- include social and cultural aspects by creating a platform for communication, interaction and sharing of knowledge with others.

Cognitive Flexible Theory (CFT)

Another aspect in developing teaching material is the incorporation of the Cognitive Flexibility Theory. This theory emphasizes repeated presentations of the same material in rearranged instruction sequences and from different conceptual perspectives.

(Spiro and Jehng, 1990)

OUM Blended Learning Mode



Visualisation

The role of visualisation as an effective method in teaching and learning of science and technical courses is evident through the various case studies conducted in the past (Edited by Gilbert, 2005; Khoo, 1998; Pea, 1993).

Visualisation in the context of education refers to both the perception of an object or phenomena that is observed and the mental image which is the product of that perception. And perception is not independent of memory. Part of what we perceive comes through our senses from the object before us, another part (and it may be the larger part) always comes out of our mind (James, 1984).

Visualisation

The seminal role of visual learning is recognised as a key which will open up new ways of looking at all aspects of science education including **practical work**, **classroom discourse**, **concept understanding** and **assessment**.

(Ramadas, 2009)

Current Situation:

Support material for selected courses:

- Courseware development
- Virtual Lab
- Video Lab

The idea is to widen the predominantly textual mode to audio and visual.

At present:

- Module published in HTML mode allowing the expansion of the textual mode to include the verbal mode and eventually the visual mode on a single platform.



How visualisation-based cognitive skill can be developed effectively?

Mental models are used to capture a type of memory that instructors want students to build.

In learning science and technical subjects, we could safely assume the presence of cognitive engagement since mental models are likely to be constructed when students are actively engaged.

However, one must consider the issue arising from the fact that students are not trained from young to develop their visual-spatial skills.

ICT Influence

The above learning environments necessary for the use of visualisation in teaching and learning of science and technical courses to be effective can be constructed with ease due to the advancement in ICT.

The paradigm shift from teaching to learning exploits hypermedia as an excellent way for self-paced and exploratory learning that based on the constructivist methodology.

Personalized instruction, instant feedback, real world simulations, and most important of all, having fun while learning, is the key features of multimedia

(McLean & Alem, 2009).

**Engaging Resilient
Preconceptions**

**Organizing Knowledge
around core concepts**

Best Practices

**Supporting Meta cognition
And Student Self-Regulation**

Cooperative Learning

National Research Council (2005)

Way Forward in Research

Phase I

- i) Identification of the student learning style and interest in science.
- ii) Study on flawed prior knowledge among students.

Phase II

Study on effective framework in achieving the cognitive goal of science education.

Phase III

Design of CFT based learning environment incorporating the outcome from phase I and phase II for effective science education.



Terima Kasih
Thank You