Knowledge Delivery Methods of Mathematics to Engineering Students in Developing Countries

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Abstract: In this paper some of the knowledge delivery methods of mathematics to engineering students in developing countries are discussed. The spectrum is extended between a theoretical approach, an applied approach, a combination of both theoretical and applied approaches, usage of computers for demonstration, usage of computers as helping tool , distance learning, e-learning, and mobile learning. A brief comparison between them is correspondingly given. The recommendations and conclusion are then stated.

Key-Words: Theoretical Approach – Applied Approach – Combined Approach – Distance Learning – E-Learning – Mobile Learning – Developing Countries – Developed Countries

1 Introduction

Some of the knowledge delivery methods of mathematics to engineering students in developing countries are discussed.

In Section 2 the theoretical approach, the applied approach, and a combination of both theoretical and applied approaches are given.

Usage of computers for demonstration and usage of computers as helping tool are illustrated in section 3.

The distance learning, e-learning, and mobile learning are studied in section 4.

In section 5 a comparison between the different knowledge delivery methods is given.

In section 6 some recommendations for the future are stated.

Finally the conclusion is then given in section 7.

2 Theoretical Approach, Applied Approach, and a Combination of both Approaches

Knowledge delivery method of mathematics to engineering students is very essential for a successful study and career. Classically there are mainly three different approaches used, namely a pure rigorous theoretical approach, an absolutely practical applied approach, and a combination of both theoretical and applied approaches (see [1]).
2.1 Theoretical Approach

At some universities in developing countries few of mathematics instructors believe strongly in teaching mathematics to engineering students quite rigorously, proving every single statement, discussing every single concept, and proving all involved theorems. They usually neglect the practical part needed by engineering students in their study and career.

2.2 Applied Approach

Many mathematics instructors in several universities in developing countries believe in teaching mathematics to engineering students quite practically with several applications. They usually neglect proving any involved statements and theorems. Often important concepts like limits, continuity, and differentiability are not explained thoroughly enough.

2.3 A combination of theoretical and applied approaches

A limited number of mathematics instructors at some universities in developing countries teach mathematics to engineering students using a balanced mixture of both theoretical and applied approaches. This approach is the most suitable for engineering students (see [2], [3], [4]).

3 Usage of Computers for Demonstration and as Helping Tool

3.1 Usage of Computers for Demonstration

Some mathematics instructors at some universities in developing countries use computers to demonstrate some graphical applications and simple derivations with the help of different sophisticated software packages like MATLAB (see [5]).

3.2 Usage of Computers as Helping Tool

At some universities in developing countries a limited number of mathematics instructors use computers as a helping tool for teaching, evaluating tests and assignments, and enabling instructors/students and students/students communications (see [6]).

4 Distance Learning, E-Learning, and Mobile Learning

4.1 Distance Learning

Distance learning started over 150 years ago in some developed countries but it was first in the 1970’s as it started to get established and praised in different countries. In the late 1990s the Quality Assurance Agency for higher education of the British government (QAA) ranked the open university in London among the top 10 universities in the United Kingdom. Also the “Freie Universitaet” in Germany is quite successful. Some students in developing countries study at some universities offering distance learning (see [7]).

4.2 E-Learning

“Several definitions exist for e-learning but the kernel is always the same: Learning through electronic technology (see [8], [9], [10]). E-learning started in the early seventies in some developed countries like USA, Canada, Australia followed in the eighties by other European countries and China (see [11]). At present e-learning is spread in many countries around the world with millions of registered students and expected to spread enormously in the near future in both developed and developing countries” see [1]).
4.3 Mobile Learning

A promising development in knowledge delivery methods in near future is mobile learning. At the beginning of the twenty first century several applications in e-commerce and e-business are already transferred to mobile learning. It is expected that mobile learning will soon spread rapidly in both developed and developing countries.

5 A Comparison between the different knowledge delivery methods

(A) Applying a pure theoretical approach in teaching mathematics rigorously to engineering students may cause serious problems to the students in their study and career while considering practical applications.

(B) Applying the applied approach in teaching mathematics in a practical way to engineering students may result in the incapability of the students to correctly understand the main concepts and theorems.

(C) In case of applying a balanced mixture of a theoretical and applied approaches will remedy the deficiencies mentioned in (A) and (B).

(D) Using distance learning by the people in developing countries was a good possibility in the 90s but e-learning proved more practical and largely replaced distance learning.

(E) “The advantages of e-learning in general like flexibility in time and position, using a huge variety of resources, improving communication locally and globally,…etc. are of course valid for both developed and developing countries.

Additional advantages for developing countries are as follows:

a) Increase of educated people in their fields as well as in modern technologies.
b) Strengthen economic situation through opening to the world markets.
c) Social and sociological development through the students using e-learning, their families, friends and communities.
d) Decrease of immigration of educated people to developed countries which represents a big problem for the developing countries at present.
e) Decrease of non-alphabetical percentage of the population who will get more support from more educated people.
f) Increase of access to all kinds of information, especially locally in some countries.
g) Integration in the world society, politically, socially, economically, etc.
h) Enhancement of global communications.
i) More opportunities for young students to study in their countries and not abroad.
j) More opportunities for continuing study for adult, especially minorities like women and retirees” (see [1]).

(F) The spreading of mobile learning in developing countries in the near future is expected due to the availability of sophisticated mobiles to many people in those countries.

6 Recommendations

(A) The approach of a balanced combination of a rigorous theoretical and a practical applied approaches is highly
Using computers for demonstration as well as a platform for evaluation and communications is also recommended.

Enhancing e-learning in developing countries is strongly recommended. To achieve that, there is a need to fulfill the following:

a) “Technical support of developed countries to developing countries through different ways, for example by sending experts to those countries or offering scholarships to educate talented people from developing countries to learn in the developed countries. Another possibility is to hold international conferences about e-learning in some developing countries.

b) Financial support of developed countries by installing necessary equipments in labs in populated regions.

c) Informing the people in developing countries about the advantages of e-learning taking into consideration their educational and social structures.

d) More support for developing countries with partially democratic systems.

e) Starting e-learning with community-oriented subject like agriculture in Egypt and banking in the Kingdom of Bahrain.

f) Educating the educators who are going to run the system.

g) Enhancing scientific communications between institutes and universities in developed and developing countries, especially those with long experience in e-learning” (see [1]).

Although enhancing e-learning is a necessity at present but it should replace traditional learning neither in developed nor developing countries. Considering the technical and financial difficulties in many developing countries the classical question in developed countries: would e-learning replace traditional learning in future? is irrelevant. A gradual introducing of e-learning is expected but not the complete replacement of traditional learning.

7 Conclusion

Due to the importance of knowledge delivery methods of mathematics to engineering students in developing countries it is very essential that governments, state, and private universities devote highest priority to this aspect. At present E-learning should be encouraged and supported and in the near future mobile learning as well.

Classical knowledge delivery methods should follow a balanced combination of a theoretical approach and an applied approach.

Traditional learning (face to face) should not be replaced by e-learning in developing countries. In all those countries an intensive informative educative campaign is accordingly very important.

Developed countries are urged to support developing countries technologically and financially. This support must be directed to the needy people and not to the governments.
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