# Enhancing E-Learning through Cognitive Structures for Learning Sports

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**Abstract.** Enhancing e-Learning through understanding and taking into account the cognitive structures of learner and trainer in learning sports is a new avenue of research. E-Learning has made its steps into all disciplines, while sports domain remains a discipline that involves physiological variables in learning. Learning sport is incomplete until a learner is trained physically and is ready to actually play the sport. The curiosity to know how e-Learning methods can be utilized for learning sports has led the work to look into the learning theories. The behaviorist approach can be efficient at the initial level. The cognitive approach has been identified as an efficient approach in advanced level learning. Cognitive theory of learning also proposes feedback mechanism, contiguity, repetition, and reinforcement. This research is to explore the possibility of enhancing e-learning using cognitive theoretical approach in learning sports.

**Keywords:** e-Learning, cognitive structure, physiological variables, Contiguity and Repetition Mechanism.

## 1    Introduction

In current scenario, there are many forums to learn sports. Due to the advancement in various technologies, learning sports is facilitated through e-learning system. *E-learning* refers to the use of Internet technologies to deliver a broad array of solutions that enhance knowledge and performance [1]. E-*learning* is commonly referred to the intentional use of networked information and communications technology in teaching and learning. It is otherwise termed as online learning, virtual learning, distributed learning, network and web based learning. Fundamentally, they all refer to educational processes that utilize information and communications technology to mediate asynchronous as well as synchronous learning and teaching activities [5]. *E-Learning* is the use of technology to enable people to learn anytime and anywhere. E-Learning can include training, the delivery of just-in-time information and guidance from experts [4].

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Cognitive structures are defined as the mental processes through which any information could be understood [3].The following section discusses the various cognitive structures in learning.

## 1.1 Cognitive Structures in Learning

Cognitivism is a learning theory which deals with the internal mental processes of the mind and how these processes could be used to endorse effective learning [6].

1. **Analysis Phase:** The tasks are first analyzed and then broken down into steps [6][7].
2. **Design Phase:** These bits of information are then used to enlarge learning in instructional design curriculum [6].
3. **Acquiring Phase:** This information is then taught from the most simple to the most complex depending on the learner's prior schema [6][7].
4. **Process Phase:** The mind contains such mental representations as logical propositions, rules, concepts, images, and analogies, and it uses mental procedures such as deduction, search, matching, rotating, and retrieval [8][9][10][11].

According to Cognitive theorists, learning is a process achieved through contiguity and repetition. It is also inferred that acquisition or reorganization of the cognitive structures is a part of learning process [2].

E-learning introduced many learner centered approaches to experience a real time learning of school sports. But when e-learning is implemented, it lacks the interactions between the learner and the trainer compared to the traditional training process. It's very hard to determine the learner's knowledge level and hence the learning process is not too effective. So the cognitive structures of the learner and trainer are employed to enhance the learning effectiveness of the E-learning sports training.

## 2 Proposed Work

This paper proposes a methodology based on cognitive structures of learners and trainers to enhance learning sports through e-learning. The overall system is viewed as three sub-systems: learner sub-system, e-learning sub-system, trainer sub-system. The following fig.1 depicts the architecture of Cognitive Structures in e-learning.

## 2.1 Learner Sub-system

The learner has mental schema, inadequate knowledge, and logical processes. Fig. 2 illustrates the components of the learner .These components are taken into account by the trainer before suggesting any concrete steps in learning. The cognitive structure of
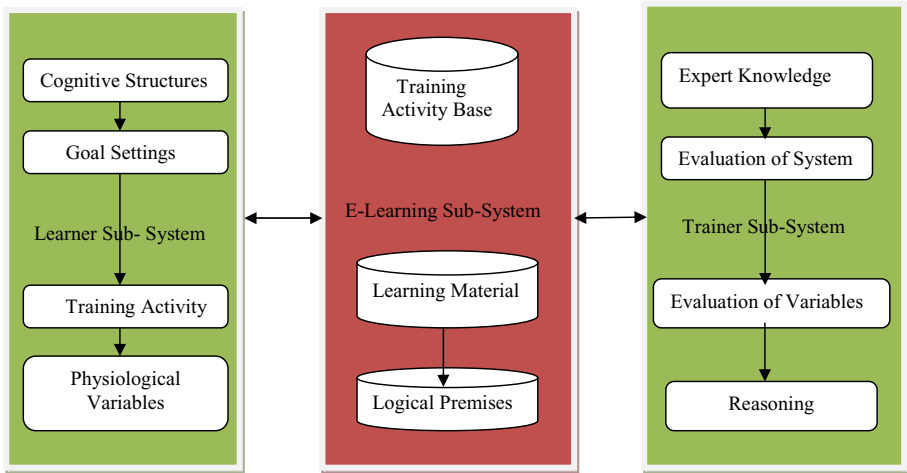
**Fig. 1.** Architecture of Cognitive Structures in e-learning

the learner presupposes that the learner has a mental schema which can be updated, modified or extended depending on the particular inadequate knowledge the learner holds in his intellectual repository. The learner presents his abilities and prior knowledge of the domain to the trainer. The learner is assessed by the trainer on his/her ability to take up a particular sport learning activity. The learner's ability is evaluated using his cognitive structures that are one's ability to perceive, inculcate, and to execute. If the learner's abilities are adequate enough to take up the lessons on the particular area of sport that the learner is willing to take, the trainer sub-system would proceed further in providing e-learning material. The assessment of the learner is done with the mental schema and mental ability (intellectual), the spirit of the learner and motivation for learning (psychological), and physical ability (physical) of the learner. The presupposition is that the learner has a little prior knowledge of what he/she is intending to learn. If the learner is not well equipped with the details of the sport, a basic knowledge through limited active participation in a sport or through literature or through visuals is taken into consideration.

The learner sub-system

- Communicates his/her prior knowledge on sport
- Communicates his/her motivational factors
- Communicates his/her physical variables
- Communicates his/her results of training activity
- Follows the feedback and suggestion from the trainer
- Takes lessons
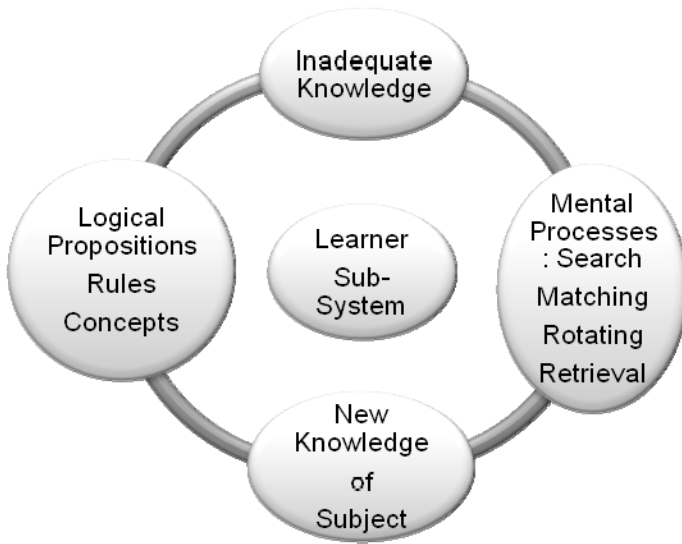- Goes through repetitions
- Reaches the goal

**Fig. 2.** Learner Sub-System

## 2.2    Trainer Sub-system

Trainer receives the data from the learner on learner's abilities, mental schema, cognitive ability, choice of sport, and the prior knowledge on sport. The data is processed by the trainer with the available tools for assessing the learner's mental and physical abilities. Appropriate sport activities are suggested by the trainer. The trainer checks the compatibility and the validity of the prior knowledge of the learner on the particular sport that the learner is intending to learn. The trainer plans the lessons based on the nature and the validity of the prior knowledge of the learner. The trainer suggests modules, lessons, trainings and tricks and evaluates the physiological variables collected from the learner. After having evaluated the progress of the learner in learning, gives feedback and motivators.

The trainer sub- system is depicted pictorially in the following fig.3

The trainer sub-system

- Assesses the learner's abilities
- Evaluates and proposes the right sport
- Gets data of efficiency and effectiveness of the learner
- Compares the learner data with the ideal values
- Suggests training modules
- Gives feedback and motivations.

**Fig. 3.** Trainer Sub-System

## 2.3    E-Learning Sub-system

The e-Learning sub-system contains modules for training the learner on various sports. The trainer calls the particular module of the sport the learner has decided to learn. The e-Learning sub-system contains training activity repository, e-material base, the standard logical premises on physiological variables and fitness. The e-Learning sub-system provides the facility for the learner-trainer interactions. The interactions between the learner and the trainer are multiple and can be repetitive.

The following fig. 4 depicts the e-Learning Sub-System which

- Contains modules on various sports
- Contains logical premises
- Contains training activities storage.

## 2.4    Feedback Mechanism

A prior knowledge of the sport might mean learning or unlearning. The good methods and tricks are to be confirmed and strengthened and bad methods and tricks are to be eliminated. For example, if someone has learnt to throw the ball wrongly, then it has to be modified or corrected or totally given up. From the constant feedback from the trainer sub-system, the learner is able to categorically judge his prior knowledge on the particular sport to be under the category of learning or to be under unlearning. Learner receives a positive feedback to reinforce learning a particular aspect of the domain under learning or a negative feedback to reinforce unlearning a particular aspect of the domain that has been part of the prior knowledge.
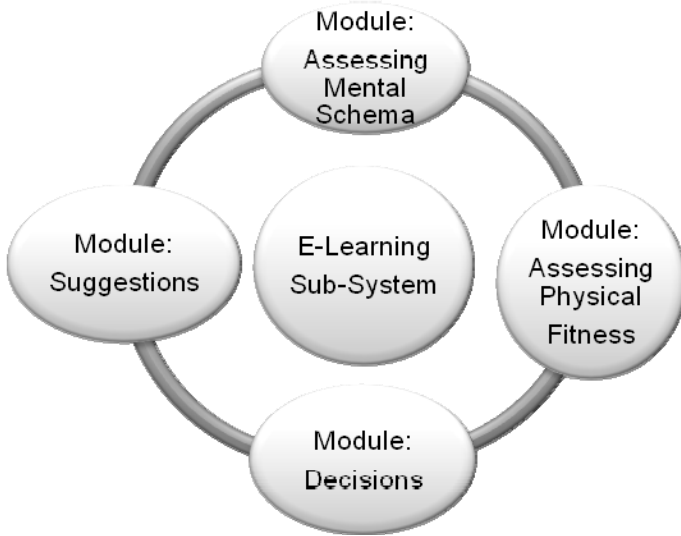
**Fig. 4.** E-Learning Sub-System

## 2.5    Contiguity and Repetition Mechanism

The model of cognitive frame in learning, contiguity and repetition are the vital methods of reinforcement in learning. The interactive system between the learner and the trainer has a feedback loop. Every time the learner wants to know his/her status and appropriateness of his/her training activity, he/she gets regular and constant feedback from the trainer. The trainer may decide to suggest the same type of lesson until the learner satisfactorily performs. Repetition of a particular lesson or training module is done until there is a significant growth in the learning process or until the stipulated time expires. The trainer might have a scale for each learner uniquely assessed from the abilities of the learner from their mental schema communication.

# 3    Conclusion

The knowledge level of the sports person about the sports activity and the learner's abilities are evaluated using cognitive structures. The data of efficiency and effectiveness of the learner is the knowledge gained by the trainer in the proposed system. The learner interacts with the trainer, wherein training modules are suggested, and finally feedback and motivations are given to the learner according to the knowledge base. Thus the learning effectiveness of the E-learning system is enhanced through the usage of learner knowledge cognitive structures in the e-learning architecture.

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