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## STUDY OF COGNITIVE AND AFFECTIVE PROCESSES IN MULTIMEDIA LEARNING

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### ABSTRACT

**T**his special section focuses on cognitive and affective processes in multimedia learning in a range of learning domains. Expanding previous research that has taken a predominantly cognitive perspective of multimedia learning, recent studies have begun to consider affective aspects of multimedia learning with the aim of integrating emotion, motivation, and other affective variables into cognitive processing models. The articles included in this special section are examples of the various ways in which the cognitive perspective can be enhanced by taking affective aspects of learning into account. Investigations range from the study of confusion as an affective state that can be beneficial to learning, and the consideration of the potential distracting or motivating function of decorative illustrations, to an inquiry into how visual design can induce positive emotions in learners. The results of the studies included in this section are in line with Moreno's Cognitive-Affective Theory of Learning with Media (CATLM; Moreno, 2006) and show how emotion and interest facilitate cognitive processing and improve cognitive and affective outcomes.

**KEYWORDS:** Multimedia learning,

*Interest, Emotion, Motivation, Affect.*

### INTRODUCTION:

As the present study aims at assessing the diagnosis based remediation on attainment of MLL in mathematics, the studies on remedial teaching have also been mentioned in this chapter. Since this area of research has witnessed a great deal of research activity, one finds several meta-analytical studies covering major aspects of mastery learning. These and the other studies connected directly with the remediation developed by Carroll and Bloom have been included in the review of literature. Further, the studies conducted by Indian researchers in the area of remedial teaching, for

obvious reasons have received a special attention in this paper.

### META-ANALYTICAL STUDIES

Meta-analytical researches are of special significance due to the fact that they have a very large database. The findings from such studies are expected to be more stable and hence generalisable over a large/population. Hence, before looking into the findings of specific studies, it was considered appropriate to review the findings of meta-analytical studies.

Guskey and Gates (1986) conducted a meta-analysis that contained 27 studies addressing five areas students' achievement, students' retention, time variables, students' affect, and teachers' variables. They found that achievement results were overwhelmingly



positive, but varied greatly from study to study. Students in attainment of mastery over taught concepts, at all levels showed increased gains in achievement over those in traditional instruction programmes. Positive effects were larger in elementary stage and junior high school classes than at the high school level. Effects in language, arts and social studies classes were slightly larger than those attained in science and mathematics classes. The studies also in agreement that mastery learning approach helped students to retain what they had learned for longer under mastery learning, both in short term and long term studies, Students were engaged in learning for longer portion of the time they spent in mastery classes and required decreasing amount of corrective time over a series of instructional units. Students developed more positive attitudes toward teaching, higher expectations for students, and greater personal responsibility for learning outcomes.

### STUDIES CONDUCTED ABROAD

Researches have been conducted to compare the effects of remedial teaching with conventional instruction. Areas focused in these studies are cognitive aspects, cognitive aspect along with the affective aspect, student achievement and time variable, student achievement and motivation, retention, transfer of learning, etc. Some of these teachers have used a modified mastery learning approach. Still others have compared the remedial teaching with certain other strategies for their effectiveness.

### STUDIES ON COGNITIVE ASPECTS OF LEARNING

A large number of studies have compared the cognitive consequences of mastery learning strategy with conventional methods of teaching. Airasian (1967), Collins (1969), Reese (1976), Mekin (1977), West (1979), Dunklenberger and Knight (1981), Hallade (1982), Mathews (1982), Arlin and Webster (1983), Reed (1983), Koczor (1984), Srivastava (1984), Gatipon (1984), Ferris (1985), Hefnes (1985), Bacon and Hawkins (1985), Tipps (1986), Sullivan (1987), Hadfi (1994), have considered some of the following cognitive aspects in their studies. Academic achievement transfer of learning (savings transfer), retention of achievement, minimum competency test, reading, reading vocabulary and reading comprehension scores, varying degree of instructional alignment on test scores, listening, speaking and writing scores, etc. Among these studies, more number of studies are in favour of mastery learning instructional strategy for being superior to the traditional methods of teaching with respect to the cognitive variables that are mentioned above. However, the studies of Mekin (1978), Reed (1983), Gatipon (1984), Ferris (1985), Bacon and Howkins (1985) show no significant difference in the two methods of teaching that were compared. But findings of Hefnes (1985) were neither completely in favour of remedial teaching nor show complete insignificant results. This research study was designed to examine the effectiveness of the mastery learning/competency-based instructional approach in facilitating the retention of achievement in language arts and mathematics. It revealed that there was no significant difference in language arts achievement when experimental group was compared with control group either on the post-test or on the retention test. But in the achievement in mathematics there was a significant difference in favour of the experimental group.

### STUDIES ON COGNITIVE AND AFFECTIVE ASPECT OF LEARNING

Researches have been conducted to compare the cognitive and affective outcomes of the mastery learning with the traditional methods of teaching. Bach (1977). Rakitan. (1977), Strasler (1979), Bauman (1980), Thomson (1980), Schwartz (1980), Dobroski (1981), Madjiman (1982), Pratt (1983), TSE (1983), Kuhn (1986) and Lovillo (1986) studied some of the following cognitive and affective aspects. Cognitive aspects studied are achievement, transfer of learning, students' perceived cognitive development, identification of complements and correct pronoun usage. Affective variables studied are attitude towards (i) the -subject taught, (ii) the method of teaching, (iii) the teacher imparting the instruction, (iv) the school anxiety towards the course behavioral problems, teacher morale, classroom problems, classroom cohesion, academic self-concept and students desire to learn through the strategy.

### STUDIES ON AFFECTIVE ASPECTS OF LEARNING

Strasler (1979) reported that the self-concept of students in the mastery learning group registered a gain. Husen (1987) advocates redemptive egalitarianism to compensate for unequal opportunities and for equalisation

of results. True social justice is possible only by equality of the available process/procedure rather than equality of access. Thus by using mastery learning strategies, a teacher can teach in a manner that will maximise student's learning. This in turn will enable the students to build a positive self--concept of them, which in turn will help them optimise their learning abilities.

From these studies it can be seen that affective consequences of mastery learning strategies seem promising. Some studies have shown that there are not only effective cognitive consequences and more favourable affective responses from students than their non-mastery counterparts but also that difference was significant. While such findings seem promising, the question arises as to whether these findings are due to Hawthorne effect. It can be seen from these researches that they have been carried out for a short period. Hence, the favourable findings may be attributed to the newness of the treatment. Thus it was not possible to ascertain whether the favourable affective responses are Just. momentary in nature and would wear off as the remedial teaching proceeds or whether they are permanent in nature that would continue to exist even though the mastery learning is used as a permanent strategy in the classroom instruction.

### **STUDIES ON COGNITIVE, AFFECTIVE AND PRE-ENTRY LEVEL CHARACTERISTICS**

Eckart's (1984) study was to investigate the effectiveness of the mastery group-based instructional system compared to the traditional lecture/discussion method in teaching remedial mathematics at the community college. A mathematics ability test and a test designed to measure the feelings about and confidence in doing mathematics were administered. A statistically significant difference was found between students in the mastery learning class and students enrolled in the control group on the final achievement test. Mastery class had a drop out rate 17% while the control group had a drop out rate of more than 20%. No significant results were found to indicate that any entry characteristic was predictive of final achievement within the two instructional conditions.

### **STUDIES ON THE COGNITIVE AND PRE-ENTRY LEVEL CHARACTERISTICS**

Studies by Block (1970); Reed (1983) and Quigley (1984) focused their attention on cognitive variable, viz. academic achievement and pre--entry characteristics like IQ, initial reading comprehension, vocabulary level.

Block (1970) studied the effect of different pre-entry levels of achievement on the subsequent learning of units and the final achievement in the groups, for whom the mastery standard was laid down as 85% and 95%, respectively and the groups for whom the mastery standard was not prescribed. He found that most students in each group (85% and 95%) learnt to approximately the same high level expected of them, thus revealing that their differences in prior achievement were not reflected in the final achievement. These differences played a large role in the learning of the first unit but subsequently decreased in the following units. However, for the group for which the learning standard was not prescribed, the influence was large in their learning throughout the sequence and their final achievement.

### **STUDIES ON TIME FACTOR**

One aspect of mastery learning that receives much consideration is time. Mastery learning theorists especially Bloom (1971) contend that mastery learning techniques reduce the amount of time needed to achieve mastery. Arlin and Webster (1983) conducted an experiment to test these time claims. Mastery learning students were compared to non mastery students. The variables assessed were achievement time and learning rate. The authors found significant increases, in learning rate and achievement in the mastery group. In relation to learning rate, mastery students learned 15.75 items per hour as compared to 12.08 items in the non-mastery students. The mastery students spent significantly more time in learning activities than non-mastery students. Mastery students averaged 40.9 minutes per chapter in contrast to 20.8 minutes per chapter in non-mastery students. In summary, these authors state it is possible to significantly raise achievement levels using mastery learning but the time needed for this increase is considerable.

### **STUDY ON THE SEQUENTIAL NATURE OF LEARNING**

Airesian (1969) tried to diagnose whether learning hierarchies exist in learning certain content, and also

attempted to test the hypothesis that if such learning hierarchies exist, then the learning of a lower level element is necessary for the learning of the related higher-level elements. It was found that learning hierarchies did exist in the learning of certain content as analyzed by two curriculum experts. Further, it was observed that more than 75% of student's response pattern showed that students who missed lower level elements' in the hierarchy also missed the related high-level elements, thus confirming the hypothesis.

### STUDIES ON THE RETEST COMPONENT OF LEARNING

Heikkinen (1984) performed a very specific research study investigating only one aspect of mastery learning viz., repeated testing. Achievement was examined using subjects who were allowed to repeat tests and subjects who were allowed only one attempt at the test. The findings of the study showed no significant correlation between achievement and repeated testing. The author states that cognitive gains obtained from mastery learning are related to a combination of remediation and retesting, not retesting alone.

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