International Journal of Applied Research

ISSN Print: 2394-7500
ISSN Online: 2394-5869
Impact Factor: 5.2
IJAR 2016; 2(4): 629-633
www.allresearchjournal.com
Received: 13-02-2016
Accepted: 15-03-2016

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Development of multisensory integration approach model

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Abstract
Every teacher expects optimum level of processing in mind of them students. The level of processing is mainly depends upon memory process. Most of the students have retrieval difficulties on past learning. Memory difficulties directly related to sensory integration. In these circumstances the investigator made an attempt to construct Multisensory integration Approach Model based on sensory process and perceptual process. Multisensory Integration approach model contains three parts the first part is Instructional part, second part is processing part and third one is learning outcome part. Instructional part is includes seven steps. There are relating new information to prior knowledge, Focusing attention to the information, developing sensory connection, Organizing the information, Expanding sensory images, Structuring the information and Practicing recall. The above instructional strategies develop stimulation, sensation, Attention, Perception, Imagery, conceptualization and memory. The learning outcome part contains from low level sensory integration (visual- Auditory) to high level sensory integration (Visual-Auditory-Tactile-Olfactory-Gustatory). The investigator regulates information processing of the students in brain through Multisensory Integration Approach Model.

Keywords: Development, Multisensory Integration, Approach, Model

1. Introduction
Development of models of teaching is the recent innovation in teaching. An important purpose of discussing models of teaching is to assist the teacher to have a wide range of approaches for creating a proper interactive environment for learning. An intelligent use of these approaches enables the teacher to adopt him to the learning needs of the students. A number of educationist and psychologists have proposed model approach to teaching. Flender, (1970) [16] put his interaction analysis as a model of teaching and for this approaches he categorized the statements of the students and teachers into ten categories. In India, the first National project on models of teaching was planned, designed and executed during 1985-86. Definition of Models of Teaching Allen and Ryan (1969) [1] Modeling is an individual demonstrating particular pattern which the trainee through imitation. B. K. Passi L. C. Singh and D. N. Sansanwal (1991) [23]. A model of teaching consist of guidelines for designing educational activities and environments. Model of teaching is a plan that can also be utilized to shape courses of studies, to design instructional material and to guide instruction. Joyce and Weil, (1972) [19] explained Teaching of model is a pattern or plan, which can be a curriculum or courses to select instructional materials and to guide a teachers actions. Educators and psychologist have design several types of teaching models which provides suitable guidelines to the teachers for modifying the behaviour of the learners. As a matter of facts some sorts of models of teaching have been existence since times immemorial. In simple language a models of teaching may be defined as a blueprint designed in advance for providing necessary structure and direction to the teacher for realizing the stipulated objectives.

Multisensory integration approach model
Hannaford (1995) has made an excellent case for sensory integration model of learning disorders: the brain's management of neural activity that produces the higher-order cognition that we recognize as 'learning'. Indeed, it appears likely that developed sensory integration skills are what enable the students' abilities that are critical for learning. Neurophysiology is about studying the brain as a biological structure, the neural mechanisms, sensory and motor

functions it performs and the cognitive processes involved in recognition memory and behavior (Carpenter, 1996).

VAK models are useful if used with full understanding of all modalities and the development of all the learning styles, where reflective learning as the highest skill in Bloom's taxonomy (Lisle, 2006) plays a lead role. Multi-sensory learning, as the name implies, is the process of learning new subject matter through the use of two or more senses. This may include combining visual, auditory, tactile-kinaesthetic, and/or even olfactory and taste (Scott, 1993).

Sensory integration is the subliminal process by which we merge and organize the information received from each and every sense into one cohesive mental picture of the natural environment. The field was established by Dr. A. Jean Ayres (1979) study on sensory integration and the child.

Ayres (1979) have attempted in this lines to design a synthesized sensory integration Model. The processing of sensory information occurs in a 4 levels.

Primary level

Vestibular, Proprioceptive and tactile are the basic three senses.

Second level

Previous three basic senses are integrated into

- bilateral coordination
- attention span
- activity level

Third level

Auditory and visual senses begin to join the basic three to produce.

- Eye – hand Coordination
- Visual perception

Fourth level

(Highest level) produces the following end products

- Ability to concentrate
- Ability to organize
- Self esteem

Joyce, Weil and Calhoun (2009) [19]. Memory model of teaching to develop students' information processing ability. It is divided into four phases:

Phase 1: Developing sensory connections
Phase 2: Focusing Attention to the information
Phase 3: Expanding sensory Images
Phase 4: Practicing Recall

The activities of four levels in Ayers' sensory integration model are fitted in above four phases. An attempt had been made by this investigator to enrich the multisensory integration approach, with an addition of three steps namely
(i) Relating new information
(ii) Organizing the information and
(iii) Structuring the information.

Further in his attempt to enrich the multisensory integration approach model, the researcher initially tried to collect all the behavioural outcomes from latest studies conducted in this area both in India and abroad.

The collected materials have been classified under the head of the four components of the multisensory integration approach i.e., Conceptual input, Structural input, Process and output. The key terms are

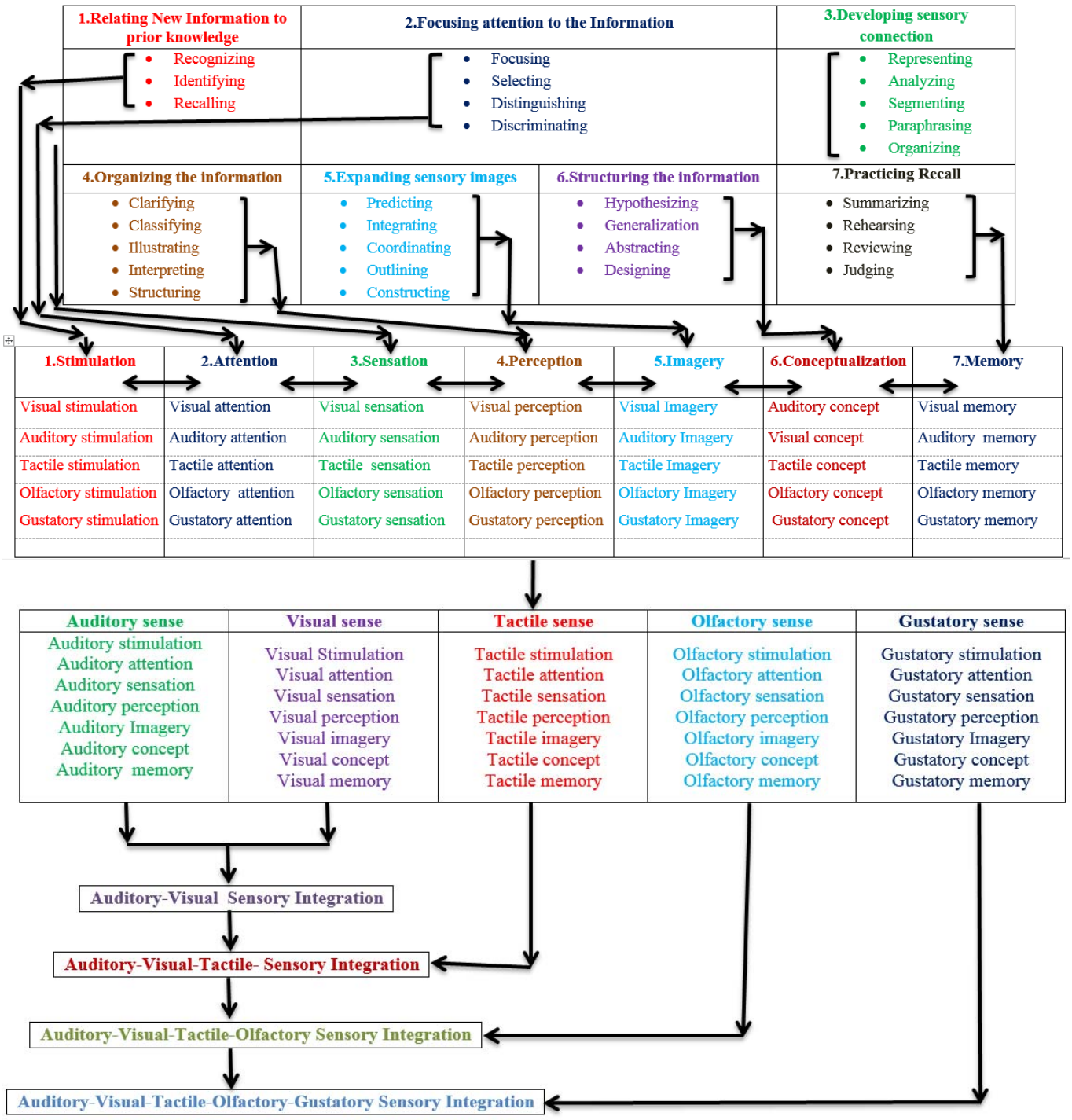
● Recognizing	● Identifying	● Recalling
● Focusing	● Selecting	● Distinguishing
● Discriminating	● Representing	● Analyzing
● Segmenting	● Paraphrasing	● Organizing
● Clarifying	● Classifying	● Illustrating
● Interpreting	● Structuring	● Predicting
● Integrating	● Coordinating	● Outlining
● Constructing	● Hypothesizing	● Generalizing
● Abstracting	● Designing	● Summarizing
● Rehearsing	● Reviewing	● Judging

The collected behavioural outcomes are rightly fitted into the steps. As a result the Multisensory integration approach has been constructed with 7 steps.

The steps are,

1. **Relating New Information**
   - Recognizing
   - Identifying
   - Recalling
2. **Focusing attention to the information**
   - Focusing
   - Selecting
   - Distinguishing
   - Discriminating
3. **Developing sensory connection**
   - Representing
   - Analyzing
   - Segmenting
   - Paraphrasing
   - Organizing
4. **Organizing the information**
   - Clarifying
   - Classifying
   - Illustrating
   - Interpreting
   - Structuring
5. **Expanding sensory images**
   - Predicting
   - Integrating
   - Coordinating
   - Outlining
   - Constructing
6. **Structuring the information**
   - Hypothesizing
   - Generalizing
   - Abstracting
   - Designing
7. **Practicing Recall**
   - Summarizing
   - Rehearsing
   - Reviewing
   - Judging

Prasannakumar Multisensory Integration Approach Model (Pmiam)



Model Description

Multiple teaching strategies including oral communication, writing, metaphor, reiteration, interactive activities, humour, music that independently benefits learning, enhances information retention through the pedagogic principle of extra information processing and the physiological engendering of neural structures (Gopnick *et al*., 2009) [17]

Sensory integration is the ability of the brain to organize the information received from the senses so as to form an appropriate response. Sensory integration takes place in the central nervous system, where complex interactions such as co-ordination, attention, autonomic function, emotions memory and high level cognitive functions are carried out. Sensory integration takes information through the senses, puts it together with prior knowledge information and memories stored in the brain to make meaningful responses.

Any information that is received from the environment through the sense organs undergoes processing and passes through sensory memory, short – term memory and finally if necessary is stored in the long – term memory. Long term memory is a good cross indexed system like a library. The capacity of long – term memory is enormous and the span of the stored information is upto the full life period of an individual. Storing of information in long-term memory is determined by encoding and retrieval processes. Another main function of the long- term memory is execution. This execution provides interest to the individual and motives him to give attention to the sensory organs. Determinants of attention, activate the sensory receptor to act as receivers of information codes. These signals undergo transduction then are coded into sensory neuro codes and finally passed on to the respective cortex of sensory memory (visual codes into

visual cortex, auditory codes into auditory cortex and tactile and other codes to somato sensory cortex).

All these codes are integrated and this is called as sensory integration. The sensory memory system has a very short time span and has very little capacity. The incoming information is identified here and then it goes to the long – term memory storage. In long – term memory, information is stored into semantic memory and episodic memory. Thus information is organized, recognized, constructed, reconstructed and stored.

Behavioral outcomes like recognizing, identifying, recalling, focusing, selecting, distinguishing, discriminating, representing, paraphrasing, analyzing, segmenting, matching, classifying, structuring, clarifying, interpreting, outlining, integrating, predicting, constructing, designing, hypothesizing, abstracting, generalizing, reviewing, summarizing, rehearsing and judging are rightly fitted in this model as steps. On practicing these steps using multisensory techniques like visual stimulus, auditory stimulus, tactile stimulus, visual attention, auditory attention, tactile attention, visual sensation, auditory sensation, tactile sensation, olfactory sensation, gustatory sensation, visual perception, auditory perception, visual image, auditory image, visual concept, auditory concept, visual memory, auditory memory etc., will strengthen the interaction among the multisensory integration components of Auditory-Visual sensory integration, Auditory-Visual-Tactile sensory integration, Auditory-visual-Tactile-Olfactory sensory integration and Auditory-Visual-Tactile-Olfactory-Gustatory sensory integration. The use of these multisensory techniques would enhance the functioning of the Multisensory integration components and thus yield good scheme for multisensory integration. An integrated approach is possible in this model To achieve optimum level of learning outcome.

The multisensory Integration approach model has mapped out in the following seven steps:

1. Relating new information to prior knowledge

The investigator discuss with students before starting a lesson in order to ensure that the students have the necessary prior knowledge and to activate this knowledge. He needs to go back to cover important prerequisite things or ask the students to do some preparatory work on their own. Then the investigator asks such questions that help the students to see relationship between what they are reading and what they have already known.

2. Focusing attention to the information.

The investigator introduces the concept by loud voice and tone modulation, use novel illustration and repetition of basic ideas. Students able to distinguish and discriminate information on the concept by investigator present stimulus variation like moving to the blackboard to write, moving towards students while questioning, using appropriate gestures while talking. The investigator teaches the lesson through integration of visual and auditory attention. He provides information through visual discrimination, auditory discrimination and tactile discrimination

3. Developing sensory connection

The investigator uses chunking strategy it leads to students able to grouping individual bits of information into meaningful larger units. He uses verbal and nonverbal cues should be sufficiently engaging they lead representing and paraphrasing on the information. The investigator correlates the information on lesson with the help of visual sensation, auditory sensation and then he uses combined effect of tactile and olfactory sensory techniques.

4. Organizing the information

The investigator uses graphic organizers they lead to clarifying and classifying of the concepts to the students. He organizes the information through visual and auditory perceptual techniques and then he integrates auditory and visual perceptual technique. The investigator uses the visual-spatial relation technique to the students for structuring the concept. Then he explains concepts through speech perceptual technique which promote better interpreting ability on information of the students.

5. Expanding sensory images

The investigator provides simulation and role-play techniques to enhance sensory image of the students. He uses metaphor, analogies and reciprocal teaching to develop mental image of the students. They develop ability of integrate of complex concepts through eye-hand coordination task provided by the investigator. Then he teaches through concept maps by using of visual and auditory imagery techniques to enrich outlining and constructing on the complex concepts of the students. Investigator uses integrate auditory image and tactile image to predicting the concept of the students.

6. Structuring the information

The investigator presents the problem by using auditory imagery technique to the students. They would be able to form hypothesis and generalize about the problem concept. The investigator uses to combine the effect of visual and auditory conceptualization technique, which leads to produce abstracting about complex concepts to the students. He permits to do experiments by tactile conceptualization technique to them. Hence they get ability to design the solution of the problem.

7. Practicing Recall

Students are able to recalling and recognizing the information by the investigator uses auditory memory and visual memory techniques. They are produced summarizing the concepts by using mnemonics techniques. He uses the working memory technique it allows disregard the information and retain the information in working memory by repeating it again and again. Transfer the information into long-term memory through rehearsal. Then the investigator gives training to the students for self-evaluation and self-reflection techniques, they produce judging about the occurrences.

Validation of the Model

A group of 30 students studying IX standard Science group were selected at random for this purpose. They were taught through the Multisensory Integration Approach Model. A pretest and posttest were conducted and those scores were tabulated. The Model was validated by subject experts.

Conclusion

After the investigator completed the determination of the steps the model was presented to the panel of experts. The panel of experts scrutinized the steps of the model and gave their opinion about the fitness of the model for application. They further commented to conduct a pilot study with the

application of the model From the pilot try out of the model it was found to be effective for application in classroom teaching. Conclusion Development of models of teaching is the recent innovation in teaching. An important purpose of discussing models of teaching is to assist the teacher to have a wide range of approaches for creating a proper interactive environment for learning. An intelligent use of these approaches enables the teacher to adopt him to the learning needs of the students.

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