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MEASUREMENT OF COGNITIVE BELIEFS AND BRAIN HEMISPHERICITY DOMINANCE AMONGST DIFFERENT BRANCHES OF ENGINEERING STUDENTS AT ENTRY AND EXIT LEVEL.

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Abstract:-Novice or beginner sees the content of science as isolated pieces of information handed down by authority and disconnected from the world around them. Every learner do carry beliefs about learning a given technical subject and Novice like beliefs affect their learning. It is expected that after going through training under a given course their beliefs should turn in to Expert like beliefs. This survey intended to find the change in the Cognitive beliefs amongst engineering students if at all, by well known Maryland Physics Expectancy test (MPEX test). Also their brain Hemisphericity dominance was observed at entry and exit level with the help of Hemisphericity Dominance Test (HDT).

Keywords: Cognitive beliefs, Hemisphericity Dominance.

INTRODUCTION

Students believe certain things about what science is and how one goes on learning selected discipline. If one interview lot of people, one finds that their beliefs lie on the scale of Novice to Expert. This research used a survey method with the help of MPEX test (5,6)which can measure where on this scale learners belief lies. It is expected that learners beliefs should be more refined that is more Expert like after completion of study. Physics is the subject used for reference as it is the common subject and the concepts of this subject are used in all the branches at various levels. From the set of questions and from the expert table developed by team (5), one can measure development of six cognitive beliefs. They are as follows:

D1: Independence. (Beliefs about learning physics- Whether it means receiving information or involves an active process of reconstructing one's own understanding).
D2: Coherence. (Beliefs about the structure of physics knowledge- As a collection of isolated pieces, or as a single coherent system)
D3: Concepts. (Beliefs about the content of physics knowledge- As formulas or as concepts that underlie the formulas)
D4: Reality link. (Beliefs about the connection between physics and reality- Whether physics is related to experiences outside the classroom or whether it is useful to think them together)
D5: Mathematics link. (Beliefs about the role of mathematics in learning physics- Whether the mathematical formulation is just to calculate numbers or is used as a way of representing information about physical phenomena)
D6: Effort. (Beliefs about the kind of activities and type of work necessary to make sense out of physics-Whether they expects to think carefully and evaluate what they are doing based on available materials and feedback or not.)

From clusters or domains, one can extract whether their answers were favorable or unfavorable for particular domain that is for a particular cognitive belief, in reference to responses given by experts(5,6). One can gauge whether current status of students are more towards experts or towards novice like. It can be clearly seen that which particular domain was unfavorable and how much. Accordingly it is possible to suggest particular remedy in the novice like belief.

HDT: Hemisphere Dominance test: (7) This is established test comprised of 50 questions with two options. Option A indicates right hemisphere dominance, and option B indicates left hemisphere dominance while selecting both options indicates the

integrated hemisphere that is a person is using both hemispheres with equal intensity. It is very important to know the overall distribution of hemisphere dominance amongst students for designing task of teaching and learning.

Definition of Hemisphericity: (7) It is the bias in thinking orientation, behavioral style, and personality resulting from the inherent laterality of one's sole Executive system within the asymmetric bilateral brain. Thus, depending upon which brain side "the one and only you" inherently is located, one is either a left or a right brain oriented person.

Left Hemisphere: This side of brain is the dominant hemisphere where language and speech are produced. It concerns with logical and analytic skills. We will term it as B.

Right Hemisphere: this side of brain is initial receiver of information. It concerns with artistic or creative abilities. These peoples usually want simple answers and prefer to think holistically.

In general it is important for instructor to have knowledge of brain Hemisphericity dominance amongst students to develop learning experiences for students.

One of the arguments that brain researchers make is that science or technical subjects learning emphasizes and favors left brain learning over right brain learning, as a result it is difficult for right brain Hemisphericity dominance person to develop expert like beliefs in such subject.

Co-relation between cognitive beliefs and brain Hemisphericity was already worked out (1) and found that the cognitive beliefs are Novice like and it may be due to learners are almost showed right Hemisphericity dominance. A lot of research has been done even on science students with the help of these tests (2,3,4) and researchers found similar observation on learners of pure science also at undergraduate levels.

METHODOLOGY AND TOOLS USED:

The sample selected for this survey was students of Engineering from Karjat District. The learners of various branches like Mechanical, Electronics and Electronic and telecommunication were observed. The cognitive beliefs were measured with the help of MPEX test (5,6) and Brain Hemisphericity was measured by HDT (7).

D's represents domains corresponding to each cognitive belief, as mentioned in the Introduction. If the favorable response is above 80% the said domain may be called as Expert like (5,6). (The addition of favorable and Unfavorable responses may not turn out to be 100% as some students may not produced any responses for that particular domain)

For HDT, A represents percentage of students having right brain dominancy while B represents percentage of students with left brain dominancy. I represent percentage of students with integrated Hemisphericity that is these students can use both the hemispheres with same efficiency.

OBSERVATIONS:

D's: Domain representing Cognitive beliefs (5,6) Also refer Introduction.
F: % of favorable response, U: % of unfavorable response.
A: represents percentage of students having right Hemisphere dominancy.
B: represents percentage of students having left Hemisphere dominancy.
I: represents percentage of students having integrated Hemisphere dominancy.
F Y: Firs year students, B E: Final year students, perusing last year of Engineering.
Total numbers of students observed were 193.

Karjat Region										
Branch	Year	D1 F/U %	D2 F/U %	D3 F/U %	D4 F/U %	D5 F/U %	D6 F/U %	A %	B %	I %
Mechanical	F Y	37/59	22/70	39/41	41/28	35/59	59/20	70	24	6
	BE	25/57	5/86	9/70	34/23	27/66	80/7	70	20	10
ETC	F Y	37/59	22/70	39/41	41/28	35/59	59/20	70	24	6
	BE	38/54	19/78	16/51	43/27	35/59	76/11	70	14	16
Electronics	F Y	37/59	22/70	39/41	41/28	35/59	59/20	70	24	6
	BE	33/55	14/70	27/64	42/30	29/50	86/8	76	15	9

ANALYSIS AND RESULT:

Development of cognitive beliefs with reference to MPEX test:

D1: the cognitive belief representing Independence, which is related to development of own understanding is found to be

Novice like. Also there is hardly any development amongst students of all the branches discussed at the entry as well as at the exit level.
D2: the cognitive belief representing Coherence, which related to the forming holistic picture of subject instead of treating it as a collection isolated pieces of information was found to be highly Novice like. Also it is found to be more Novice like at the finale year than at the entry level.
D3: the cognitive belief representing Concept, which is related to the understanding of concept lying within formulae is Novice like. Also it was found to be more Novice like at the finale year.
D4: the cognitive belief representing Reality link, which indicates perception of laws with reality surrounded was found to be Novice like. Also it was found to be similarly Novice like amongst students of all branches.
D5: the cognitive belief representing Mathematics link, which indicates consideration of equations, formulae as a way to represent information, observation was found to be Novice like. Also it was found to be similarly Novice like amongst students of all branches.
D6: the cognitive belief representing Effort, which represents Beliefs about the kind of activities and type of work necessary to make sense out of physics-Whether they expects to think carefully and evaluate what they are doing based on available materials and feedback or not, was found to be Novice like at the entry level but found to be Expert like at the exit level.

The percentage of students with right Hemisphericity dominance was found to be more than other possibilities.

Also the percentage of students having left Hemisphericity decreases with years but there is little increase in integrated hemisphere dominance.

Thus it was observed that the cognitive beliefs of learners at various branches are Novice like without any development with their years of training, except domain of Effort.

Students are from the group of Right Hemisphericity dominance and hence deliveries of different learning instructions are expected for the learners.

Further, study of learning styles are recommended, and also use of demonstrations experiments with ICT is also recommended.

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