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Abstract

Intuition is the key concept in the research process and research behavior. It belongs to higher order learning. There are cases of intuition in the world in abundance and in all walks of life. Intuition differs from insight. It's a quality indicator of the research behavior and research products. Learning science did appreciable advancements in 'learning by teaching', but none in 'learning by research'. Intuition could be studied as an objective in the taxonomy of research. There are three sources of literature in support: i) A school of ancient Indian philosophers, Vedantins studied niddhidhyasana and practiced in their curriculum. Niddhidhyasana via. upasana is the technique of inculcation of intuition. ii) Blooms and Flanders could show a way that intuition to be an objective of research, and finally iii) computational models of learning also support it.

Keywords : Research Behaviors (RB), Learning by teaching (LT), Learning by research (LR), Taxonomy of Research (ToR), Niddhidhyasana, Upasana (meditative intuition), Tapah, Lower order learning (LoL), Higher order Learning (HoL).

Intuition is a psychological concept, but has its deep roots in many other branches of science - spirituality, education and neurology, and hence an legitimate topic of the learning science. It's a challenge to the recently born division of science, 'the learning science'. The basic question of intuition, is its very existence. Whether it exists? Or only hypothetical? There are strong attempts in spiritual sciences, and meager efforts in the objective sciences. As an educational psychologist, I am rather interested in its nature and applications in learning. I set to investigate the role of intuition in learning by research. My final word on intuition is that **'its role in research is inestimable'**. It's the significant indicator in deciding the quality of the research behavior of the researchers. Back ground by which I was driven to talk about the enquiry into the existence, availability, nature, and its role in learning is quite interesting. Let me devote few lines on this theme, as it helps us to provide some insights into intuition.

As an enthusiastic young scholar of educational psychology, at the age of 30 years guy, I had my topic for Ph.D. Education under the guidance of a stalwart Professor S. C. Sarma, the then Dean, Faculty of Education, Andhra University, Visakhapattanam, India, above 2400th rank university in the present day university rankings. With much discussions and deliberations in between us I could finalize my topic for thesis viz. "A Study of Relationship between Teacher Effectiveness, Ability to Publish, and Self-concept of Teachers". I got my doctorate in 1985. It's a comedy. But, my efforts of further probing were not stopped at that end. I had bitter experiences with regard to the assessment of ability of publication. In a way, it's the measurement of quality of research of the teachers, the university teachers. In late

seventies, there were no tools to measure the quality of researchers except the peer-ratings, an age old technique with its serious merits and demerits. So, I myself made a tool, "Research Index Card (RIC)". It's a quantitative measure. The publications of the researcher ranging from a simple local publication to the highest international publication were arranged and proper weight-ages were assigned to get a score. Thus I tried to quantify the research ability of the university teachers. However, I myself was not satisfied, yet it is the measure even today in India to promotion policy of the university teachers. I have been contemplating on the assessment of research ability during the last 33 years, of course not continuously. I tried my hand in research in half-a-dozen areas, among which the present one is one.

Inspiration, hints and data for the study of intuition are derived from three sources viz., the science of education with reference to taxonomy of educational objectives of Blooms and his associates and Flanders, the classical Indian philosophy- niddhidhyasana, upasana, and Samadhi, and the computational learning models- neurosciences, brain-wave studies.

In the year 2007 the Indian Institute of Science (IIS) organized an international seminar on the higher education and I presented a paper, viz. the 'Taxonomy of Research'. Naturally, taxonomy leads to objective assessment. I followed foot prints of the evaluation of the learning out comes developed and much studied by the educationists like Bloom, Simson, and Krathowl. The technique of their success in evaluation of learning is 'taxonomy of educational objectives' developed by them. Professor Bloom was the in-charge of public examinations of the Chicago school district. While observing millions of answer scripts, he could have the benefit of an intuition



into the total teaching-learning process-objectives, instruction, and evaluation on one hand and learning outcomes on the other. He worked from 1954-57 to conclude his taxonomy. In the year 1982 John Biggs developed a parallel taxonomy, by name SOLO for the cognitive domain. I could get a clue from their "Learning objectives, Teaching behavior and learning outcomes". When there is a success story of our own twin, teaching why cannot we be benefitted by analogy?

Thus, an idea flashed in my mind with the following concepts of research: Objectives, process, and products of research, research behavior of researchers, researching behaviors of researchers, out-comes of research, and finally, 'taxonomy of research'. To my surprise, all the concepts are un-attempted in this field up-to-date. I am the pioneer. I assumed and concluded that both teaching and research are the two fields of the 'science of learning', their core being 'learning'. At the same time see the difference; if a content known to somebody is learnt by us, it is designated as is teaching, while a content unknown to anybody in the world up to that point of time that is research. They represent the two hemi-spheres of the brain, the left for teaching (reasoning) and the right for research (intuition). Then I caught hold of Flanders. What he did? He could study the teaching behaviors of teachers while the teaching-learning process is going-on under a micro-scope. His key concept is 'teaching behavior'. So, I got the idea of 'research behavior'.

Again, there is an interesting episode: Bloom could do all his exercise with his taxonomy with three domains-cognitive, affective, and psycho-motor. Yes, we do agree these three are sufficient, or partially to explain the teaching-learning process, but I don't believe the three are enough to explain the process of research, it is beyond. As I pointed earlier, the research is concerned with the right hemi-sphere, while teaching to the left. It is always easy to understand an objective phenomenon, but not the subjective one. We also knew that the research process cannot stand alone without the left-brain. It's inclusive of the left-brain. Thus, I granted the three domains of the Bloom's taxonomy and wanted to extend it to the study of the right-hemisphere in connection with the process of research. In this context, I could see the role of 'intuition' in research. I could imagine not only intuition, but also scientific speculation, insight, creativity, and decision making. In some other context, Peri (2012) classified and defined two constructs; 'Lower order learning' and higher order learning'. LoL are responsible for teaching mostly, and the HoL for the research. The intuition belongs to the HoL.

There is another inspiration or hint from the classical Indian philosophy/psychology. The Vedantins of Hinduism about 2nd century BC had a theory of "sravana-

manana-niddhidhyasana" developed by them for the understanding of teaching-learning and research processes. Sravana is a Sanskrit word to give meaning of 'comprehension', and Manana to mean 'reflective thinking'. Niddhidhyasana means un-interrupted thinking

(by any thinking of any other dissimilar object) on an object. In my view, this niddhidhyasana is responsible for the mental mechanisms underlying the research. The niddhidhyasana results in intuition, insight, which helps to penetrate us into the real nature of things. Capra Fritz famous physicist, calls this as understanding from the inner (self) to outer (world). He contrasts invention by experimentation (scientific method) and invention by intuition; both aim at arriving at truth. Experimentation requires laboratory setting, a set of hypotheses, and experiment to test them, in contrast intuition doesn't require all these, but requires a tree to sit under, closed eyes to look into yourself, and tapah (meditate) and arrive at the conclusion. Japah (chant with lip-movement) and tapah chant without movement of any organ) are the instruments for intuition. Peri (2002, 2005) contended that the trio- of "sravana-manana-niddhidhyasana" constitutes a taxonomy of learning, not simply a of taxonomy of teaching or a taxonomy of research, but a comprehensive taxonomy of 'learning' including its two fields, 'LoL, and HoL'. My conclusion is Niddhidhyasana is concerned with research. Niddhidhyasana results in intuition. For Niddhidhyasana upasana is the technique. "Upasana is the technique for trans-personal learning (Peri, 2011)".

There is evidence from the neuroscience about the intuition. Maslow in his book, "The farther reaches of human nature", reported an experiment of Kamiya regarding the alpha rhythm and learning. In the alpha rhythm the individual can learn well. It's a meditative state when one can learn easily and effectively. Sage Patanjali's Samadhi state could be state where intuition is possible. "If the Mind can be fixed on a centre for twelve seconds it will be a concentration, twelve such concentrations will be a Meditation, and twelve such Meditations will be a Samadhi (Vivekananda, 1982)."

The Vocabulary used in Yoga is: Dharana = Concentration: Sustained attention on an object. Dhyana = Contemplation: Concentration becomes deep and remains as uninterrupted. Samadhi = Supra-consciousness.

To sum up the discussion up to this point- intuition plays a dominant role in the process of research, and it belongs to higher order learning (above learning by teaching), and intuition is possible by niddhidhyasana. The findings of Kamiya (1968) sheds light on Samadhi state which facilitates higher order learning in the domain of research.

Concept of Intuition

Intuition is an instinct. It's a natural learning. Intuition is the ability to acquire knowledge without inference and/or



the use of reason. "The word 'intuition' comes from the Latin word 'intueri' which is usually translated as 'to look inside' or 'to contemplate'." Intuition provides us with beliefs that we cannot justify in every case. For this reason, it has been the subject of study in psychology, as well as a topic of interest in the supernatural. The "right brain" is popularly associated with intuitive processes such as aesthetic abilities. Some scientists have contended that intuition is associated with innovation in scientific discovery. Intuition is also a common subject of New Age writings. In more-recent psychology, intuition can encompass the ability to know valid solutions to problems and decision making. Intuition is a knowing, a sensing that is beyond the conscious understanding - a gut feeling. Intuition is not pseudo-science according to Abella Arthur. Jung defines intuition as: perception via the unconscious. Intuition may be defined as understanding or knowing without conscious recourse to thought, observation or reason. Some see this unmediated process as somehow mystical while others describe intuition as being a response to unconscious cues or implicitly apprehended prior learning.- Dr. Jason Gallate & Ms Shannan Keen B.A.

There are cases where intuition is clearly demonstrated. Though there are many examples around me in India, I quote those which are popular globally, so that the readers can easily understand my stand.

Archimedes (science): We know very well how he invented the Archimedes principle.

Buddha (spiritual): He has founded the root cause of human sufferings and advocated principle of non-violence.

Ekalavya (archery): Rejected by guru Dronacharya for teaching archery, he made the mud image of his guru, and practiced attained archery with unequal skills.

Einstein (science): He saw an unusual beam of light on which he used to sat and could reach the highest height in science.

Kekule (science): Founded closed structured Benzene which gave birth to a new branch of Chemistry, the Organic chemistry whose applications are infinite in the modern world. He dreamt a snake with its tail in its mouth, suggesting closed structure of elements. Till then only open structures are known to the world.

Patanjali (yoga): By deep meditation he could write yoga/Sanskrit grammar/Ayurveda books. He is the father of psychology declaring the yoga as the science of understanding, measuring, predicting, and controlling the waves of the mind.

Srinivasa Ramnujam (mathematics): With the gift of intuition by the goddess Lakshmi of Namakkal (a town in Tamilnadu, India) solved unsolved problems in mathematics.

Steve Jobs returned from India he said, "The main thing I've learned is intuition".

Valmiki (poetry): Author of the first Sanskrit epic, Ramayana composed with the intuition via. tapas provided by the sage Narada.

Characteristics of Intuition : It is symbolic, possible by conditioned learning with a code word, deity etc., correlated with high emotional tone, through a dominant sentiment, engages all sense organs, requires deep concentration, requires high commitment, requires clear imagery, requires deep meditation, requires a value system, requires a high level of self-confidence, doesn't assume a high IQ, predictable, upasana is the pre-requisite.

Differs from Insight

Peri (2011) argued that both insight and intuition belong to the higher order learning. He placed insight at a higher position to insight. Scholarship in that learning, clear perception, high level IQ, maturity and organizing capacity are required for insight. Intuition is a natural way of learning, and hence all these factors may not be the pre-requisites.

Intuition always associated with high tone of emotion, self-confidence, and something trans-personal qualities.

Gut feeling is common to both.

Deeper involvement of all the senses is required in the case of intuition, but to a lesser degree for insight.

Dominant sentiment aides the intuition.

Comparatively, higher levels of concentration and commitment are required for intuition.

Intuition is conditioned with a symbol, deity etc.

Taxonomy of Research (ToR): The dictionary meaning of taxonomy is systematic or classification. For the query, classification of what, the answer is simple-the subject under study. If it is Chemistry, it is classification of elements according to some criteria, say atomic weight or number as for convince. If taxonomy of research is developed we can: identify the research behaviors, classify the research behaviors, develop hierarchy of research behaviors, and develop a tool for measurement of research behaviors.

By the taxonomy of research we find solutions to the following questions:

Defining of research-out-comes, and research behavior,

How to identify the research behaviors of researchers and research-out-comes,

How to evolve hierarchy of research behaviors,

How to develop a tool to measure the effectiveness of the research behaviors of researchers, and

How to measure and evaluate the research out-comes.

Suggested Strategy: Peri, (2011) aims at developing Research-outcomes, which makes Research approach and assessment scientific as Bloom's taxonomy did for



teaching. As in Education, let us develop ToR for research, by which we can have a scientific approach for Research. The process of the proposed ToR would be down-to-bottom analysis of the research behavior of researchers to obtain fundamental units of research behavior followed by synthesis; sets, groups, clusters et. id. Then we can be able to study the characteristics of their complexes. We, Educationists know very well to where the ToR takes us. Simply, we can deduce its functions, advantages, disadvantages, scope, and limitations from our experience of Bloom's and Biggs's Taxonomies to a greater extent. Naturally, some doubts appear immediately regarding its format, classes, domains, objectives, research-out-comes etc. Let us initiate the work and face the challenges. When the researcher discussed the proposal of ToR with Professor David Krathowl in 2007 in the University of Syracuse he commented, "Ours is the basic work and many people appreciated, others argued for changes, some others differed and had their taxonomies, and some others extended the taxonomy for the teaching of their subjects like medicine, and so on. He encouraged researcher with the words, "GO AHEAD". Blind following or copying in total is always dangerous. The researcher took inspiration from Bloom and Krathowl, and deviates where ever necessary. In other words, Peri (2012) declares, "Where Blooms ends, there starts Peri".

Place of Intuition in the proposed Taxonomy of Research: If an attempt is made to develop taxonomy of research, it naturally includes intuition as an objective, just as K-6 in the Bloom's taxonomy. As to the question, why taxonomy of research, the answer is simple-the sub-field of the Learning Science, research also be benefitted as its counterpart Teaching. Accordingly, Peri (2007, and 2012) is constructing a taxonomy of research. Further he argues that intuition is a quality indicator of the research process as well its products. Scheme of Peri's taxonomy could be summarized:

ToR with four domains - cognitive, affective, psychomotor, and inventive.

Objectives and specifications of the first four domains are taken as they are from the Bloomian and for the fourth domain, the objectives are: scientific speculation, intuition, insight, creativity, and problem solving.

Objective specifications of these objectives, i.e. scientific speculation, intuition, insight, creativity, and problem solving are being identified.

Objective specifications of intuition can be derived from the characteristics of the intuition as given above.

The readers are requested to help me in identifying the objective specifications.

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