RELEVANCE OF LEARNING THEORIES, AND TECNICAL EDUCATION TO YASHPAL COMMITTEE’S RECOMMENDATIONS (2009)

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Abstract
The present paper provides some of the critical comments on the report of the “Committee to advice on Renovation and Rejuvenation of Higher education “under the chairmanship of Prof Yashpal, published in 2009. The paper tries to establish the need of awareness and understanding of Theories of learning, theories of knowledge construction and systems thinking in education to the engineering and polytechnic teachers for bringing in quality in technical education. The paper highlights the issues raised by Prof. Yashpal committee.

INTRODUCTION
The report of the “Committee to advice on Renovation and Rejuvenation of Higher education “under the chairmanship of Prof Yashpal was published in 2009. The Committee deserves congratulations for the seminal work on Higher Education which is of critical importance to national development.

Before I start commenting on the recommendations of the Committee, I would like to state the reasons why I as the former faculty and also later head of NITTTR Chandigarh got interested in the Committee's recommendations. This is because the Committee while referring to IITs and IIMs did not refer even once to NITTTRs (initially known as TTTIs) and established by MHRD since 1965 and have the same status as IITs and IIMs. It has been entrusted with the work of improving quality of education in the higher technical education system: IITs, IIM NITs. Engineering colleges and Polytechnics.

Also I would briefly describe my personal experience and the gradual evolution of my understanding of the role of NITTTRs as a resource system and important contribution educational sciences in general and learning theories in particular make to the quality of both general and technical education. The awareness of this knowledge base has not spread as yet in the higher education circles.

I was appointed as the professor of Civil Engineering and then selected as the Principal of the institute and worked there for 25 years from 1969 to 1992. From 1988 till the retirement in 1992, I continued my assistance to the Technical Bureau of MHRD in their work on the National Policy on Education project (NPE) and later their World Bank assisted project on “Improvement of Technician Education” in the capacity of the Chief Project Coordinator in the NPIU. During this period I had worked as the Industry-Institute Interaction expert in the UNESCO Project for Technician education project in Bangladesh for 9 months. After retirement, I was appointed as the consultant to the State Board of Technical Education of Maharashtra State from 1992 to 2003.

Within this project period I was invited to assist the College of Engineering Pune (COEP) in their TEQUIP project in which I helped the State to design project for the COEP for the World Bank assistance. This project was approved. During the same period I was invited to conduct Teacher Training Programmes for two organizations: 1. Council of Architecture for their Teachers in Architectural colleges in Maharashtra and 2. Teachers of the constituent colleges of the Indra Prastha University New Delhi. After 2003 my health did not permit me to continue to work actively, but I continued to study and am still learning about learning sciences*. I have almost for the last 25 years been studying educational sciences. During my service in NITTTR as a faculty from Engineering, I approached our education faculty to teach me and my staff basic concepts of learning and instruction. This dialogue failed miserably and till today the gap between them has not been bridged. The Committee also highlights the lack dialogue among various departments of the Universities. This is, thus, the universal phenomena throughout the educational institutes in the world. This gap is not intentionally created. This is due to the total absence of awareness of three emerging disciplines among the educational participants (Students, teachers, HODs. Principals, state level/national level educational mangers).

1. Theories of learning
2. Theories of knowledge construction
3. Systems thinking in education

These disciplines are not exclusive, they also interact among themselves. More importantly they are transdisciplinary in nature. This was the central theme of my earlier presentation to the Yashpal Committee as a whole made by me in my letter dated 17th August 09. My explanation to the contention of the Yashpal Committee report regarding absence of dialogue between various disciplines among various disciplines in universities and institutes of higher learning was the absence of awareness of the three emerging educational disciplines mentioned above.

HIGHLIGHTS OF THE ISSUES RAISED BY THE YASHPAL COMMITTEE.

The following paragraphs in this section give a summary of the ideas discussed in the Yashpal Committee's report.

1.0 IDEA OF UNIVERSITY
University is a place where creative minds converge, interact with others and construct visions of new realities. Established notions of truth are challenged in the pursuit of knowledge. To be able to do teaching and research without external interference, universities should be entirely autonomous.
Teaching and research are inseparable. Universities should function democratically and transcend cultural, political, and geographical boundaries and avoid fragmentation of knowledge and should overcome caste and class hierarchy, patriarchy and other cultural prejudices and become a source of new knowledge and skills and provide space for creativity and innovation.

Higher education should include both university education and also professional education and should be considered as the national responsibility

2.0 CHALLENGES OF HIGHER EDUCATION

2.1 Distances and disconnect

1. Problems that characterize Higher Education are “
   - Loss of primacy of University in Higher Education.
   - Erosion of its autonomy
   - Undermining its undergraduate programmes
   - Growing distance between knowledge areas
   - Isolation of the Universities from the real world
   - Crass commercialization

2. Undergraduate and graduate programmes are blamed for being too theoretical and unable to provide explanatory power to enable students to make sense of the world around.

3. There is a divide between research bodies and the universities, even though research and teaching go together.

4. IITs and IIMs are isolated from the idea of universities. They should try to become universities, to prevent isolation of engineering and management from other knowledge areas like social sciences and humanities. This will motivate professionals to engage with local communities and catch opportunities to enhance learning by solving real life problems in their environment.

5. There’s an erosion of space endangering dialogue and liberal enquiry and establishing norms of democratic behaviour.

2.2 Architecture of learning

2.2.1 Curricular Issues and Syllabus Making

1. Graduates of HE pass out without the kind of skills to work in the real world environment.

2. There is a need to attend to curricular issues and syllabus making to prevent Students from rote learning and encourage them to learn with understanding, and develop ability to think and transfer their understanding to solve real life problems.

3. Curriculum reform should include compulsory exposure to and engagement with different kinds of knowledge gained in the class room, apprenticeship, internship and engagement with surroundings.

4. Universities should adopt a curricular approach which treats knowledge in a holistic manner and create exciting opportunities for different kinds of interfaces between disciplines. They should also ensure alignment of evaluation and examinations with its curriculum objectives.

2.2.2 Learning Across Disciplines

Unidisciplinary knowledge even at the undergraduate level in Universities with further specialization is not good for learners. Linking that discipline with real world problems requires that learners value all learning in every discipline.

Undergraduate level learners should be exposed to various disciplines in an integrated manner.

2.2.3 Teacher Education

Educational system as whole comprises pre-primary, primary, secondary, higher secondary and higher education. There is a great need for integrated planning of teacher education for the whole system. Instead of being handled by different agencies, teacher education should be brought under one roof for integrated planning.

2.2.4 Rehabilitating Professional Education

Bring IITs/IIMs within the idea of a university to bring professional graduates into holistic social development framework. Trivialization of specialization in professional education should be stopped.

Vocational education should develop links with university and professional higher education. Current demands of the economic and social development need upgradeation of vocations. Also barriers encountered by students in the vocational stream to entry in university should be removed so that they can upgrade their knowledge. (Author’ Note)

Literature in the advance countries term this route to higher education as “the Second chance way to higher education”

2.2.5 Undergraduate courses which are now being conducted in affiliated colleges should now be integrated with the University system. All universities should have undergraduate course.

2.2.6 Performance Criteria

Proposed autonomous universities should evolve performance criteria to enable them to assess their performance periodically. Performance criteria will have three parameters:

1. Socio-cultural aims of higher education, and transformation role of education.

2. Academic excellence without isolating themselves from the social context.

3. Institutional self reform enriched by sense of social responsibility and process of internal self evaluation.

I have not summarized following issues described in the report. Even though they are equally important, the issues covered in sections 1.0 and 2.1 and 2.2 are more closely related to my ideas I am presenting in this paper. I wish to bring these ideas to the notice of the Committee and the proposed NCHER, as well as other educational experts they are.
2.3 Structure, Expansion and Access
2.4 Governance and Autonomy
2.5 Multiplication of Regulatory Agencies

3.0 RECOVERING THE IDEA OF A UNIVERSITY – A ROAD MAP

My views intended to be complementary to the views presented in the committee report

Accepting the fact that the Committee report of this type cannot go into details of certain key concepts especially mentioned in section 2.0, I feel I should highlight certain critical aspects of learning, knowledge construction and systems thinking in education. The terms Learning, Knowledge, and Systems teaching, Instructional reform curricular reforms, and reforms in Educational planning at institutional, state and national level are repeated at several places in the report. Modern theories recently have made substantial advances in these areas. I will try to elaborate them as briefly as possible and try to highlight key concepts in these advanced theories as I have understood them.

1 About NITTTRs

But before I start, I must point out that there is no mention of my Institute, that is, NITTTR where I worked for 25 years. That is probably because the Committee members belonged to university educational stream which was isolated from the professional, technical and vocational education. Fortunately IITs/IIMs were nationally known, as they were considered as having a status similar to universities. On the contrary, TTTIs were ignored even by IITs/IIMs because of their initial association with the polytechnic education. The question of noticing the work done by TTTIs in the field of learning, instruction, curriculum design and development, educational planning did not arise for the University system and UGC. The higher education—both the university stream and the IITs/IIMs—have always taken for granted that they know everything about learning, pedagogy, systems thinking in education, curriculum development, educational planning etc and still continue to do so. Their firm belief in the subject matter mastery has led them to believe that learning, instructional strategies, curriculum strategies come to them naturally. This, of course, is not true, when they will realize as they start struggling with the demands of the NCHER. They are already facing demands by the Supreme Court ruling regarding dealing with SC and ST students’ learning disabilities and Shri Sibal, the new HRD minister’s suggestions to IITs to act as mentors to other engineering colleges and IITs and NITs. This will require more than a mere strong focus on subject matter mastery. Dealing with learning disabilities and mentoring engineering colleges, needs knowledge and skills of a resource system to their client that is the educational institutions. These are based on knowledge of learning theory, pedagogy, curriculum theory and theory of educational planning. (Branseford 2000)

The last Review Committee for TTTIs chaired by Dr Inder Sen recommended upgrading TTTIs to NITTTRs with an enhanced role of acting as resource systems even for degree level technical and vocational educational institutes. This recommendation was accepted by MHRD. But as usual the MHRD forgot to establish teacher training programmes for this NITTTR themselves faculty and have left the existing faculty to struggle for them and find ways to cope with the new challenges. NITTTRs have to play a very important role in continuing research and development in learning, instruction, and curriculum envelopment, technical and vocational education planning and development and apply them to the technical and vocational education system. But without the faculty development programmes with a focus on learning theory, theory of instructional design etc the faculty will find it hard to cope with it.

Let me now briefly explain Systems theory, Learning theory and Theory of knowledge construction.

2. General and Social Systems Theory

The whole section 2.0:--- Challenge of HE--- appears to me as described in the Committee’s report within the framework of Social Systems Theory. But this theory is not visible and implicit in the report. General systems theory and Social systems theory are as applicable to all Educational System. It is emerging as a scientific discipline (DALE. SMITH, NORLIN, CHESS (6d) Human Behaviour and Social Environment–Social Systems Theory), 2009; Pearson (Allyn Bacon) Boston: USA)

Let me describe core ideas embedded in the Social systems theory.

Briefly General System’s theory (GST) is the theory of order; it has been likened to a science of wholeness. The basic assumption is: there is an underlying intelligible order in the world to which all matter relates and the existing social order is a subset of this general order According to GST, the growth and change in a living organism cannot be explained by linear-based cause and effect relationship, but by the relationships and interactions among the parts comprising the whole organism. The current trend of physical scientists is to adopt “Reductionism” as means to explain any phenomena by the linear-based cause and effect relationship. Reductionism says that to understand the whole, understand its parts. But what is lost in this view is the understanding of the whole organized entity. Hence reductionism cannot validly explain how a living system like educational system, human body, functions holistically.

Social system is the subset of General System. A social system is any entity comprised of individuals which have functionally interdependent relationships with one another. A family, social group, a formal organization, a community, and society are considered as different levels of hierarchy within the overall society.

Social systems have following characteristics:

1. Dynamic Relationship between elements and above mentioned levels of society. Dynamic means things being studied are in the state of motion. This concept helps one to
anticipate complex relationships between the system elements and the consequences that follow. When we change one element of a System, it affects other elements within the same system.

2. **Structural** which defines the fixed element of a system and the dynamics occurring within this defined structure. One of the most important structural features is the boundary, the point where one system ends and the other begins.

3. **Hierarchy** (Holarchy) in which SST addresses the relationship between systems of different sizes, ranging from individual, family, social group, formal organizations, community, and society. Here 'Hierarchy' does not mean power or status, but the concentric organization of smaller systems embedded within a larger social system. In Systems theory this term 'Hierarchy' is now replaced by another one “Holarchy”. Each lower system is nested in the larger system.

4. **Comprehensive**: SST helps any social worker to avoid settling for simplistic explanation for any phenomenon occurring at any one level, but requires him to look at all levels simultaneously for explanations.

5. **Interactional**: Any social system constantly interacts with its environment. It takes input from the environment and transforms it into outputs which are given back to the environment.

6. **Evaluative Feedback**: Any System needs feedback information from outsiders as well as insiders to confirm that it is functioning well or, whether changes need to be made in the very way the system operates.

7. **Holistic**: SST places emphasis on the connectedness of any phenomena at every level of holarchy which is always seen as the part of the whole. The functional purpose of all living systems is to achieve a steady state, in which the system functions efficiently, is adapted to the environment, achieves its aims and provides for its subsystems. This it does by maintaining a balance between input it takes from the environment and the output it gives back. Too much input without giving back desirable output fattens the system. On the other hand, too much expectations of output from the system by the environment without providing adequate input, makes the system anemic. Both these states make the system unstable leading to disintegration.

This is the brief sketch of the Social Systems Theory, which are also applicable to higher educational systems. The Committee report constantly harps on the holistic view whether of educational systems and knowledge systems (disciplines), and even physical systems (space, equipments, energy, time, and finances).

To illustrate, the whole educational systems ranging from pre-primary to higher education, have dynamic relationships with one another, each sub-system like primary, secondary schools etc have distinctive structure of its own and function within well defined boundaries, and are also dynamically related to one another at their interfaces. All these educational systems are hierarchically arranged not according to their status or power, but holarchically, smaller systems concentrically embedded within the larger system. It is comprehensive, because before giving explanation as to why rote learning is dominant in a particular education subsystem, say, secondary schools, you look at this secondary school system in relation to other systems like primary, secondary as well as the higher secondary and higher education to find out how earlier school systems have affected the secondary school and also how the educational requirement in higher-level system affects perceptions of students and teachers in the educational systems lower in hierarchy. Every educational system is interactional, because every school system takes, for example, raw students (inputs) from its environment and transforms them through education/ training process into educated and trained manpower (output) and gives them back to the environment for staffing other systems. In the process, it consumes also resources input (space, human, information, time and finances) and uses them during the transformation of students and throws back into the environment unused resources as waste. Every school system needs feedback on how it functions or whether certain changes are needed to be introduced. While searching for the causes one does not employ reductionism, but looks to the whole system. Every single school system as well as the whole system must function efficiently, must be adapted to the environment, achieve its aim, and finally, provide for its subsystems. This is the optimal state of the system as whole educational system to maintain steady state.

4. **THEORIES OF LEARNING AS AN EMERGING DISCIPLINE**

Next to the GST and SST, this is another emerging discipline. The Committee report only makes a passing remark about “learning” This is not adequate to make impression on the consciousness of the educationist, especially operating in higher education. NCHER will have to make special effort to attract the attention of all educationists that such a theory of learning really exists. And that learning and teaching are the skills that does not, repeat, do not come to anyone naturally while simply practicing on the job like any other physical skills without cognitive elements. There is a lot of cognitive component in learning and teaching skills.

The detailed title of this theory should be: “Theories of learning by children, adolescent and adults”

Those interested in theories of learning are referred to following three references:

- **BRANSFORD. How People learn**;
- **ORMROD J.E. Human Learning**;
- **BOWDEN, MARTON the University of Learning**;

OECD publications, Paris; National Academic Press, USA
have indicated that this topic is emerging as a discipline. Because of its emerging nature, NCHER will have to take special measures to make policy makers, researchers and educational managers (students, teachers, HODs, principals and state and national level educational planners) aware of the critical importance of the learning theories and theories of knowledge construction.

Learning theories deal with the gradual evolution of human learning from Behaviourism through Social learning through Social cognitive learning to Cognitivism (which in turn comprises information processing theory, constructivism and contextual learning). This evolution was caused by the increased need of humans to comprehend more complex physical and organic world in order to solve problems of human survival. This has also caused shift from incidental learning (learning in the process of daily getting things done) to intentional learning (learning through consciously planned strategies aimed at long term storage and retrieval of knowledge and skills in all living systems). The recent development of great importance is about learning deeply to understand and to affect transfer of knowledge to problems faced by the learners in their daily lives.

It is also important to note that in the modern world, learning takes place at three places (BOWDEN and MARTON. The University of Learning):

- At the individual level designed to learn new information and skills not possessed by the learner but possessed by the teacher or scientist. This the learner learns independently at home with print and non-print media or in the class rooms. The resulting knowledge is idiosyncratic i.e. specific to the learner, but not shared by others.

- At the collective level by community of professional researchers in the universities and researching professionals engaged in professional practice. Community of professional researchers is designed to discover new laws of nature and community of researching professional designed to invent new general strategies of professional practice which will then be incorporated by fellow professionals in their professional practice. The resulting knowledge is shared publicly and is passed on to the younger generation by the teachers and scientists.

- At the local level by a team of workers in a workplace designed to invent new strategies and better products and services to enhance their customers' capacity to function effectively, efficiently, ethically, elegantly and efficaciously. The resulting knowledge is shared only by the limited number of team members; hence the term “Local level”

Lastly, at all levels, the learning is influenced by affect (feelings and emotions) as well as social environment. This is only a very brief sketch of what learning theory implies.

5. THEORIES OF KNOWLEDGE CONSTRUCTION AS AN EMERGING DISCIPLINE

(BOWDEN AND MARTON. The University of Learning, 1998)

All learning results in knowledge construction by individuals, community of learners and team members at workplaces. At each level the knowledge constructed is of different kind, but all play their roles in different contexts.

At the individual level, the individual learner constructs his knowledge based on what he already knows. If the existing knowledge contains misconceptions i.e. the understanding not in tune with what the teacher wants him to know, it remains implicit and carries this misconceived knowledge as the truth and considers what is taught in the class as too theoretical and not practical. The teacher should require him to express his current knowledge explicitly and note these misconceptions and take measures to correct them (Bransford, 2000.)

At the collective level, community of researchers in the universities, the knowledge is constructed in the form of discovery of laws of nature which are reliable, valid and repeatable, yet accepted with skepticism by other scientists about the absolute nature of truth. The knowledge constructed by the research professional is in the form of general strategies of professional practice which can be shared and incorporated in their own practice by all fellow professionals. This updated store of knowledge created by the professional researchers and researching professionals is shared publicly. And is passed on to younger generation from which future professional researchers and researching professional will emerge to continue the process of knowledge construction at the collective level. All these communities develop norms and standard methodologies to ensure validity and reliability and continuation of skepticism about the absolute nature of truth. This skepticism creates motivation to continue research.

At the level of local learning, the team develops its own knowledge of new strategies for problem-solving and the new knowledge about improved products and services. This knowledge is explicit, but its sharing is limited to the team members at the workplaces.

This also is a very brief sketch of the theories of knowledge construction. The intention is to convey to NCHER the message that the Commission will have to make explicit the existence of the evolutionary nature of these three emerging disciplines: Theories of Learning. Theories of knowledge construction and the GST and Social systems theory as applied to education.

These theories have another characteristic, the power of transdisciplinarity and interdisciplinarity.

According to OECD publication titled “Interdisciplinarity, the problem of research and teaching in universities”. (1970), all these three disciplines contain concepts, principles and procedures which are transdisciplinary in nature. Eric Jantch
in his article in the same publication writes: (selectively quoted) about transdisciplinarity:

“With transdisciplinarity the whole education system would be coordinated at multilevel, multi-goal system embracing a multitude of-coordinated interdisciplinary two level system which, of course, would be modified in the transdisciplinary framework. Transdisciplinary concepts and principles for the whole system change significantly with change in the 'overall systems purpose' towards which the top coordinating function of:' Meaning “ in fig 1 is oriented. Our best efforts must therefore focus on the top structure of the system”

The overall systems purpose has been described by the Yashpal Committee. “Transform current university system into a unique place where creative minds converge, interact with others and construct a vision of new realities. Established norms of truth are challenged in pursuit of knowledge. Universities should be entirely autonomous to be able to do research and teach without external interferences and political and economic pressures. Teaching and research are inseparable, function democratically and should attain universal knowledge, transcending geographical, cultural and political boundaries and avoid fragmentation of knowledge. Higher education will include both university and professional education and is the national responsibility and the state has to make necessary provision to realize its potential”

This, I think, is all axiomatics introduced at the highest purposive level in the pyramid i.e.' education /innovation system', the term used by Erich Jantsch.

Further, I would like to add and submit that the three disciplines: Learning theories, theories of knowledge construction, and systems thinking as applied to education Contain concepts, principles and procedures which have transdisciplinary characteristics and can be used to organize disciplines at all levels below the purposive level: empirical, pragmatic, normative.

I had a unique experience of using various concepts of these disciplines as the head of NITTTR, chief project coordinator of NPIU for the MHRD's World Bank assisted projects for technician education, later as the educational consultant to the state of Maharashtra for their State's World Bank assisted project for both technician and college education. In all these projects, I intuitively took a decision to use whatever I knew about systems concepts, theories of learning and theories of knowledge construction. I succeeded to a great extent. All of these World Bank projects were approved and launched by MHRD. Even as I continued to refine my knowledge about learning theories, I realized that modern learning theories are more and more shaped by neural science and cognitive sciences and have become more comprehensive. The emerging nature of this science is now confirmed by recent OECD publications and National Academic Press publications, USA. (See references below)

Our every day perception about systems, learning and knowledge stems from the experience we have in our everyday activities of learning in schools and colleges and later in professional activities. The dominant perception is
that learning, teaching, curriculum design, institutional
design and state/national level educational planning skills are
the skills that one learns on the job –in class rooms,
departmental and institutional daily activities. Management
scientists call them “theories-in-use”. The validity of these
theories-in-use is never debated and is taken for granted.
Such assumptions are hard to change. But they influence our
behaviour. While dealing with national/state level
educational managers, principals, HODs, teachers and
students, there were very few who could be convinced that
(with some exceptions) that learning, systems thinking and
knowledge creation have scientific base and need to be learnt.
Hence they always talked confidently about learning,
systems, and knowledge. NCHER will have to make
Herculean efforts to contradict these taken for granted
assumptions to all participants of the entire education system
and make them study these disciplines more in-depth. Only
then educational reform can be accelerated.

As regards bringing about planned change in the educational
system to achieve Committee's vision, I noticed from the
publication of the Society for Research in Higher Education (SRHE: Buckingham, U.K.) that all British universities have
strengthened their Schools of Education and have made them
responsible for research in education, learning, knowledge
construction and systems thinking in education, and apply the
new knowledge through reform projects in collaboration with
the university departments to bring about change in the
quality of higher educational processes: learning, teaching,
curriculum development institutional/state/national level
educational planning.

I am convinced that three disciplines are as fundamental to the
educational reform just as physics, chemistry, mathematics
are to the advancement of physical sciences and technology
development.

To conclude, Yashpal Committee's vision of an autonomous
university as a link to bring educational reform is possible
only when all educational institution pay attention to, study
and master concepts, principles and procedures of the above
mentioned fundamental educational disciplines and also
understand the concepts of interdisciplinarity and
transdisciplinarity. These disciplines can then be applied to
translate into reality Yashpal Committee's vision of the autonomous
universities and NCHER.

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