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A Study on Indian Technical Education Empowering India with respect to International Contexts and Perspectives

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ABSTRACT: Technical education system is one of the outstanding Indian organizations which play a dominant role in human resource development of country to reinforce and promote the quality of every human life worldwide. Technical education system acts as fortitude in developing the economic growth of India affording high quality engineers, technologists, entrepreneurs, etc. with mankind values to serve the nation. The extensive agenda discussed in this paper is to improve international contextual perception. International context and perspective involves curriculum development, technology enhanced learning, teaching and assessment components of student learning, student support system, work, career development with culture for holistic education. One of the major performances of curriculum development is syllabus framing for every course with an enhancement. Syllabus framing can be segregated into four different categories such as creativity and problem solving, programming with logical thinking, project based learning on technologies, intellectual abilities with competencies and skills. Technology enhanced learning comprises different firm of teaching methodologies such as interactive classrooms, constructive teaching, flipped classroom, creative design thinking, E-learning and Jig saws. Assessment, components of student learning can be assessed on research paper submission, project thesis, online certification courses, industry foundation program case study presentation, World level ACM ICPC programming contest assignments and tool based learning. Student support systems embroils members of research societies, clubs for financially challenged and physically challenged students, student committee making friends and connections, overseas higher education training cell, tutor ward system, IASTE student exchange system and spiritual development cell. Work, career and culture development implicates alumni cell, career and professional development cell, outreach social activities, outside world connection via facebook, whatsapp, linkedIn, etc, technical academy to train students for employability, collaboration with other campus students, centre of excellence and collaboration with industry minds.

KEYWORDS: Curriculum Development, Technology Enhanced Learning, Teaching and Assessment components, Student Support System, Work, Career Development.

I. INTRODUCTION

Technical education is one of the prominent education system launched to develop the human resource worldwide with respect to the upcoming technologies. In India [2], it contributes a major share to the overall education scheme and plays an essential role in social and economic development of country concerning the social welfare. Technical education improves the manpower and quality of every human life. Technical [2] education covers various domains

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such as Medical Sciences, Engineering, Pharmacy, Management, Technology, Agriculture, Architecture and Town planning, Applied arts & crafts, Hotel management and Catering Technology, etc.

A. *Origin and Functioning of AICTE:*

All India Council for Technical Education (AICTE) was initially set up in November 1945 as a national level advisory governing body [1]. AICTE was initially established to conduct survey on the facilities of technical education and also to [1] promote the educational development in country. Later in the year 1987, AICTE [1] was given statutory status so that it can be able to plan, formulate and maintain the standards of technical education. AICTE is also responsible for quality and management of technical education in the domain of education [1]. After its inception in 1988, for the first five years the Minister for human resource development, Government of India was the chairman of the council [1]. The first full time chairman was appointed on July 2, 1993 with a term of three years. AICTE comprises of five major bureaus and fourteen cells [1]. For each bureau, Adviser is the bureau head who is assisted by technical officers. The predominant mission of AICTE is to expedite world class technical education in the country [1]

B. *Schemes Provided by AICTE:*

- To set up new polytechnics in unserved and underserved districts [3]
- Scheme of Community Development through Polytechnics (CDTP) [3]
- Construction of Women's Hostels in Polytechnics [3]
- Up-gradation of Polytechnics [3]
- Establishment of Centers of Excellence in Frontier Areas of Science and Technology (Fast) [3]
- Establishment of Design Innovation Centre [3].
- National Scheme of Apprenticeship Training [3]
- Support for Distance Education & Web Based Learning (NPTEL) [3]
- Indian National Digital Library in Engineering,(Science and Technology)[3]

C. *Functioning of ISTE:*

The Indian Society for Technical Education (ISTE) is one of the dominant national professional non-profit making societies in technical education system. Initially it was started in 1941 as the Association of Principals of Technical Institutions (APTI) [4]. At present, ISTE has large membership base consisting of more than 1,02,985 life members, 5,54,094 Student Members, 2410 Institutional members including IIT'S, NIT'S and other leading technical institutions in India [4]. Technical education system provides personality improvement to the students and the teacher's career to empower the education system by Indian Society for technical Education (ISTE). The motto of ISTE [4] is "career development of teachers, personality development of students and overall development of our Technical Education System". The main objective of ISTE is to assist the production and development of engineering professionals by providing quality training program to teachers thus improving their skill in their respective fields [4].

D. Importance of Technical Education:

- To accomplish self employability
- To support self supporting [5]
- Industry Collaboration [6]
- Innovation in Research and Development [6]
- To promote distance education [6]
- Industrial growth and social upliftment [6]
- To increase the economic growth of country
- To produce more entrepreneurs
- To upgrade with enhanced technology resources for the welfare of human kind

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The discussion of the paper is as follows. Section I provides a brief description about AICTE, ISTE. Section II describes about curriculum development, technology enhanced learning, teaching and assessment components of student learning, student support system, work, and career and culture development for holistic education. Section III concludes the paper.

II. RELATED WOK

A. *International Context and Perspective on Curriculum Development:*

Curriculum development is defined as a planned and purposed system used to improve the process of any educational system [7] [8]. Every time there is a change in the development of curriculum based on the upcoming technology aspects, concepts, applications, etc. Curriculum development is one of the prominent systems being launched by AICTE to improve the technical education system for the changing era. It is acting as a backbone to [7] [8] increase the economic growth of country. Curriculum development process involves planning, articulating and developing, implementing and evaluating [9]. Planning comprises [9] curriculum development committee, identifying trends in the specific content domain and assessing issues. Articulating and developing is composed of course goals with syllabus, identify resource materials. Implementing involves testing new program into practice [9]. Evaluating involves updating the program being processed and determining the success of the processed program [9].One of the major performances of curriculum development is articulating and developing which involves the syllabus framing for every course with an enhancement.

Syllabus framing can be segregated into four different categories such as creativity and problem solving, programming with logical thinking, project based learning on technologies, intellectual abilities with competencies and skills. Creativity and problem solving involves the courses such as Machine Learning, Wireless Sensor Networks, Quantum Computing, Data Science, Optimization Techniques, Theory of Computation, Compiler Design, User Experience Design. Programming with logical thinking involves the courses such as Data Structure with core Java, Design and Analysis of Algorithm using core Java, Advanced C programming with graphics, Computer Essentials, Web Technology with advanced Java programming, Python programming, Ruby on Rails Web Development, Computer graphics and Multimedia.

Project based learning on technologies comprises the courses such as Image processing, Data Warehousing and Mining, Big Data Analytics, Artificial Intelligence, Database technologies, Emerging Technologies on Wireless Communication, Smart phone, IoT and Augmented reality, Big Data, Multimedia, Mobile Application, Web Development, Robotics. Intellectual Abilities with competencies and skills incorporates the courses such as Business Communication & Presentation Skills, Advanced Interviewing Techniques, Essentials of Entrepreneurship, Reasoning Skills of Analytical thinking and Logical thinking and Quantitative Aptitude.

B. *International Context and Perspective on Technology Enhanced Learning:*

Technology enhanced learning is not a new concept but has to be renewed to enhance the learning of students. Technology enhanced learning [10] refers to technologies related to education system. It deals with enhanced learning using enhanced classrooms for better interactive learning environment by incorporating cognitive tools, methodologies mapping with the upcoming technologies [10]. Technology enhanced learning [10] leverages technology to maximize the better and interactive learning environment thus giving students a time, place, pace and pleasant learning environment forever.[12] Different levels of technology enhanced learning is level 1 – Teacher transmission, level 2 – Student action, level 3 – Interaction and level 4 – Transaction. Different teaching methodologies with respect to technologies are interactive classrooms, constructive teaching, flipped classroom, creative design thinking, E-learning and Jig saws.

Interactive classroom is one of the best teaching methodologies. It involves smart board teaching with appropriate teaching tools such as virtual labs, Google class room, Snap Talk or View Talk, Circle Poster, Role play, Riddle Me Books, Chapter Tours, Curriculum based Student's Theatre, IEPC, Discussion Method, Think About it, Mental Models, Fish Bowl [16]. Constructive teaching is a teaching methodology in which training will be to give students before learning in the form of groups. Each group will be given the task such as Experimentation, Research projects, Field trips, Class discussions on real time problems, [18] problem based learning, [18] Interactive demonstrations and Case study [17]. Flipped classroom is also called as inverting classroom [11] [13]. Inverting classroom is a model in which students is expected to perform prior learning of course to the class. [11] [13] Once the learning of concepts is done by

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student, then the teacher will perform inquiry based learning in the class i.e. teacher will enquire and clarify the doubts. The advantage is it helps students to gain more practical knowledge by making students to take up online study on tools for already learnt concept.

Creative design thinking is also termed as case method in which real time application cases will be given to the group of student in class [13]. It [13] involves group analysis, brainstorming, innovation and creative ideas. This will help students to improve the analytical skills and creativity to analyze the real cases. E-learning is also called as self learning or electronic learning. E learning provides the student various way of learning methodologies such as E – books, Audio Books, Blogs, Podcasts, Wikis, Video learning (You Tube), Virtual labs, Digital libraries, MOOCs, learning management [13] [14] systems such as WebCT, Moodle. A jig saw [15] is one of the teaching methodologies. In jigsaw, class is divided into different teams in which each team should prepare separate but related assignments. When all team members are prepared, the class is re-divided into mixed groups, with one member from each team in each group. Each person in the group teaches the rest of the group what he/she knows, and the group then tackles an assignment together that pulls all of the pieces together to form the full picture, hence the name jigsaw [15]

C. *International Context and Perspective on Teaching and Assessment Components of Student Learning:*

Assessment refers to various methods used to assess, evaluate and measure the learning outcome of students. Assessment can be of pre assessment, formative assessment, summative assessment, placement assessment, Interim assessment, screening assessment. Assessment is performed [19] on the data of student learning to refine and improve the student learning. Assessment components of student learning can be assessed on research paper submission, project thesis, online certification courses, industry foundation program case study presentation, World level ACM ICPC programming contest assignments and tool based learning.

Research paper submission is considered as one of the assessment component to evaluate the student learning process. Research helps the student to come out with innovative ideas. R&D cell should train the students with appropriate research procedures and should encourage submitting paper in National Journal, National Conference International Journal, and International Conference. This helps the student to innovate more innovative ideas and gaining of deeper new knowledge. This will help students to collaborate with professional societies joining as members of it. An interaction with outside world will make students to face professional challenges and friendly collaboration with professional bodies.

Project thesis is considered as one of the assessment component to evaluate the student learning. Mini project in the curriculum makes the student to submit the project thesis. R&D cell can also help students in implementing the project. Also this component will help the students to be very strong in their specialized domain. This component will be an added advantage in resume from the perspective of employability of students. A student has to award the best project so that students will be encouraged to gain enhanced knowledge. An online certification course is considered as one of the assessment component to evaluate the student learning process. This is one way of providing E – learning to the students. There are many online certification course forums such as Coursera, EDX, MIT Open Courseware and The Open University, etc. Student has to be encouraged to register with the courses which are out of curriculum because they can gain more knowledge along with certificates being provided by MIT, Hardvard University, Berkeley university, Texas, UBC, etc. Some of the online courses can be Data Science, Machine Learning on Neural Networks, and Ruby on Rails Web development, etc.

Industry foundation program case study presentation is considered as one of the assessment component to evaluate the student learning. Foundation program is the one which uses the industry material such as Java, Object oriented concepts, DBMS providing case studies. These case studies have to be given to the students to implement and provide a presentation demo in the classroom. In this, assessment, the group formation has to be avoided completely. The copyrighted company material will help the students to be trained at an advanced industry expected level. World level ACM ICPC programming contest assignments is considered as one of the assessment component to evaluate the student learning. It is an [20] Association for Computing Machinery (ACM) International Collegiate Programming Contest (ICPC) being sponsored by IBM, headquarter at Baylor University. It is a multi tier; team based programming competition [21] conducted every year. These programming contest questions along with test cases can be given as assignment questions to the students. This will help the students to understand the problem complexity level and implementation with test cases. Instead of writing assignments on some topic which is available in internet students can be followed up to implement the contest questions and submit assignments.

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Tool based learning is considered as one of the assessment component to evaluate the student learning. Some of the engineering tools such as Network Simulator tools, Data Mining tools, Cloud Computing tools, Data Analytical tools, [22] Data parsing, Data conversion, File retrieval, Format checking tools, IDE's, Coding Sandboxes, Web Development tools, Testing tools and [23] Software tools. Student has to learn any of the above tools to obtain the internal assessment marks. This learning can be made both offline and online with certificates.

D. *International Context and Perspective on Student Support System:*

Student support system will help the students to cope with any kind of problems, trails, challenges in the real world as a professional with social and ethical concern. This support has to be provided by the institution with full pledged pleasant environment for the welfare of students. Student support systems embroils members of research societies, clubs for financially challenged and physically challenged students, student committee making friends and connections, overseas higher education training cell, tutor ward system, IASTE student exchange system and spiritual development cell. Research societies can be R&D cell, professional bodies, and members of professional societies. This will help students to excel in research area gaining new knowledge of experience.

Clubs for financially challenged and physically challenged students has to provide appropriate financial funding to continue poor student studies at next higher level. This club has to help the students who are from poor backward classes with higher education dreams and goals and also favoring physically challenged student in terms of academic financial needs. Student committee is a committee in which members can be campus friends, caring and loving faculty members. This committee has to be organized and recognized by the management of any institution thus helping students to get a warm support for self employability, organizing events, association activities, etc. Overseas higher education training cell should be organized and recognized by institution.

Cell has to arrange coaching classes for higher education such as GRE, GATE, TOEFL, etc. also should provide training for government related exams such as TNPSC, IAS/IPS, Bank exams, Army, Military, etc. Tutor ward system is a system which is completely monitored by the faculty members of respective classes. Each class will be allocated 3 faculty members as tutor. Each tutor will be given around 25 students. Those 25 student details will be completely maintained by their respective tutor. Tutor of 25 students has to act as caring, nursing, teaching, counseling, guarding faculty. Tutor should act as a shepherd for 25 students.

IASTE student exchange system is the one which is recognized and governed by the top most universities such as Karunya University. It is a system where UG and PG students will be allowed to obtain dual degree by doing mutual exchange of students with other universities in countries such as Brazil, Turkey, Japan, and Europe to undertake an internship program completing their final year project with a stipend of 30K per month. Spiritual development cell is the process of constructing prayer cell within institutions. Different cultured students can make use of prayer cell. This will help the students to continue their studies in a very pleasant, loving and peaceful environment. This will teach the students basic human behaviors, values, compassion, mercy, characters, socializing motto, helping motive, caring, concerning for one another.

E. *International Context and Perspective on Work, Career and Culture Development:*

Work, career and culture development implicates alumni cell, career and professional development cell, outreach social activities, outside world connection via facebook, whatsapp, linkedIn, etc, technical academy to train students for employability, collaboration with other campus students, centre of excellence and collaboration with industry minds. Holistic education requires good work with better career and best culture development. Alumni cell is made available in all the institutions to serve the college students from outside the campus. This cell provides an opportunity to train the juniors technically and help get placed in good product based companies. Career professional development cell includes placement activities and services, Internship activities, Workshops, Hands-On training, Technical events and Contests, Entrepreneurship program, outreach social activities, outside world connection via face book, whatsapp, linkedIn, etc.

Technical Academy is the platform which helps students to get trained on very basic fundamentals of technical subjects with respect to IT sector needs such as C, Advanced C, Core Java, DBMS, Operating systems, Advanced Java Programming, Unix and shell programming, Networking, Data structures, Design and Analysis of Algorithms, etc. This academy makes student to gain trough knowledge in the basics of fundamental courses. Collaboration with other campus students, centre of excellence and collaboration with industry mind can provide a path way and more

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opportunities for students to get into IT companies such as Infosys campus connect training, Wipro PRP training, CISCO and JUNIPER based network training, etc. because the company training will be provided by faculty members who all are trained by company experts at company. It also involves faculty exchange and student exchange collaboration. This collaboration helps a lot to students in terms of employability, self improvement, growth of institution and management.

III. CONCLUSION

We conclude that to empower the technical education in India International context and perception plays a dominant role in the development of student education system. We have discussed some of the context and perception on curriculum development related to syllabus, technology enhanced learning, teaching methodology and assessment components, student support system and career development. They are many more different perspectives of technical education methodologies related to global empowerment of human resource where detailed study of those schemes can be discussed in future.

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