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In This Issue

Universal Values and Ethics in Education for the Digital Age

PB Sharma*

The question whether the call for Digital India in July 2015 was based on conviction or compulsion is no longer debatable. What is however debatable is whether India could have done far better as a country with respect to transparency and integration of its systems if the digital age would have arrived a decade or more earlier, say at the beginning of the 21st century. The bold decision to achieve the target of Digital India was associated with a few unpleasant looking decisions like demonetisation of currency; implementation of GST; restricting the use of hard currency in transactions; making banking to go digital including in the rural areas; and transactions of almost all businesses and governance online. Thanks to COVID-19 for accelerating the digital transformation during 2020, the year otherwise marred by unprecedented pressure on nation's economy, trade and businesses. Education, for a long time, had remained untouched by the disruptions caused by technology advancements. In fact, the COVID-19 compelled rapid adaptation of digital technologies for imparting education digitally and made people interact and express through a host of online webinars, conferences and seminars that have been organised during the ongoing COVID-19 times. A new teaching learning environment has now been created that facilitates learning anytime, anywhere and as per one's interest areas. The days of student centric learning are now becoming a reality with digital systems taking learning to learners at an affordable cost and cutting across boundaries of nation.

But then the Digital Age has brought its own challenges. Loss of privacy, data piracy, data theft, cybercrimes, guides and misguides of social media and a colossal waste of time on digital apps that have created new compulsions and raised issues relating to ethics and values in the digital age beyond the normal call for ethics and values in a civilised society. These issues include:

- *Digital Identity* of individuals, groups and organisations that relate to information on the internet (personal or organisational data, images, files, news, comments and so on) that can be used to impact the image and reputation of an individual or an organisation;

- *Online Security* raising concerns for information integrity, data theft, and misrepresentation of facts and situations;

- *Online Bullying* and techno-addiction arising out of unregulated use of social media and online resources often impacting the mental and psychological wellbeing of people including teachers and students of schools, colleges and universities (Jenny, 2016).

Self-regulation or self-control described as *Aatma-Sanyam* in the Bhagwat Gita comes here as a highly desirable virtue that protects the

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interest of an individual and the society as a whole. In fact, in the ancient Vedic tradition of education, *Aatma-Sanyam,* was the master key for self-learning; and *Swadhyaya* for enlightenment, which was mandated as a non-negotiable trait of noble citizenship that lead to a righteous way of life, full of divine bliss and glory for oneself. The Bhagwat Gita[2] ordains *Aatma Sanyam Yogagno Jubhyate Jnan Deeptam,* meaning that the lamp of knowledge is lit by the fire of self-regulation. We need to integrate self-regulation, *Aatma Sanyam,* as a universal value in our education system and mandate it for use of the vast information and knowledge in the digital space. However, self-regulation at its own cannot be sustained without strict compliance to a righteous way of life that necessitates nurturing of ethical, moral and spiritual dimensions alongside work ethics and professional morals that have become more important now in the digital age that provides easy access to information, knowledge and expertise.

21st Century Skills Need Character and Attitude

In 2016, the World Economic Forum (3) published an overview of 21st century skills that are necessary for workers in the digital age. Competencies such as problem-solving and effective communication are already very important in many jobs for working in a team. Critical thinking, innovativeness, optimum design and translating ideas into new products and application development have emerged as the necessary part of the skill set to innovate and excel both individually and as a team. In addition, qualities such as a positive attitude, personal integrity, connect with *aatmiyata*, empathy and caring concern for society and environment have now become important to create winning teams that lead to achievement of goals and realisation of the vision of an organisation. Adaptability of new technologies, persistence and sustainability have become equally important in the digital age as these qualities ensure greater resilience and success in the face of a changing work and social environment. With these qualities, workers can add a great value to the use of smart automation and integration of new and advanced technologies like Artificial Intelligence (AI) in the digital systems of analysis and decision making. But capabilities and character skills are not only to be valued either for organisational success or for individual attainment of repute and status, but the importance of ethics and human values are to be recognised for the sustenance of a righteous world order to create a peaceful coexistence in the society. The upbringing, family environment and education play important roles in nurturing ethics and human values and develop character skills of truthfulness, integrity and empathy—*aatmiyata*. Unfortunately, the family environment in the present modern society mindlessly engaged in materialistic pursuits is becoming more and more disconnected from sustaining an environment for nurturing values and ethics. The major reasons for this is urbanisation and of course a change in lifestyle, which has brought about a lot of inflation as well. One salary in a household is not enough and therefore with both partners working full time, it becomes difficult to instill the kind of values that perhaps our previous generations were able to. In such a situation, the role of education in nurturing human values and making a well-rounded individual and humane at the same time becomes more a difficult task.

Nurturing Universal Value Chain in Education

Looking at the Indian traditions of education in ancient India, we find that the *Gurukuls* of ancient India were firmly committed to nurturing human values, ethics and morals along with developing capabilities, competence and character. The society and social systems further ensured the compliance of human values, work ethics and professional morals with highest level of sincerity in all walks of life. The peer pressure and good governance further promoted value-based administration, trade and business that was supported by social and religious systems that together created responsible citizenship. They built a human society where truthfulness – strict adherence to the truth, *Satya*; heartfulness – with one's entire heart or conviction, i.e., *Aatmiyata*; empathy or *Aatma-sanyam*, i.e., self-discipline and service over self; *Niskam Karma* – work without thinking about the gains – became the hallmark of the Indian society that could sustain unmatched prosperity and happiness in abundance for a blissful life for its people for millenniums together. No wonder India used to be the world leader in education and wisdom that created sustainable layers of peace, progress, prosperity and happiness, which impacted human society in nations around the globe. Indian society also marched beyond humanism to serve the whole world as one family by inspiring the human society to work for the welfare of one and all, cutting across the barriers of cast, creed, religious faith, geographical boundaries, and proclaim that the whole world is one family—*Vasudha-ev-Kutumbakam.* The globalised society and its calls for 'the world is one' is to rebuild the ancient wisdom was proclaimed long ago – *Satyamev Jayate Naratam* – the truth triumphs. In the Digital Age today, these age-old ethos of ancient Indian wisdom have found a greater relevance as the digital technology demands

highest care and commitment to truth and truthfulness for nurturing a fair and just global society.

Education, especially higher education, is to be the fountainhead of a developed, prosperous and enlightened human society that shall contribute to peace, prosperity, harmony and happiness all around. This is, of course, a tall order, but then who other than educators can deliver this promise. This calls for a sustained focus on quality, relevance and excellence, nurtured in an environment of integration of education with values so that the universities and institutions in India could become, in a true sense, partners in progress of the nation's development and meet global aspirations of human excellence.

However, the education in the digital era has to discover the ways and means of creating a learning environment that parallel to developing capabilities also nurture human values of truthfulness, peaceful coexistence, harmony with nature and above all conducting oneself with utmost sincerity and self-regulation to work and live a dignified human life. This requires new and innovative education models now that the digital technologies have deeply penetrated all walks of life. Value-based education environment nurturing the vital value chain alongside with capabilities to trade and transact in modern technology intensive work environment. Learning to live together in peace and harmony and creating and sustaining a life full of divine bliss not only for humans but for all living beings, would then be a reality. We therefore need to create an additional space in the school and university curriculum to nurture universal human values and create that intrinsic desire to practice these values with pleasure in all aspects of work and social life. In essence, this calls for creating modern *Gurukuls* where education shall be perceived not just an empowerment for enlightenment and glory but as torchbearers for creating and sustaining a compassionate humanity. The disconnect created by the modern education between the physical and spiritual person would then be eliminated, allowing a human being to manifest his fullest potential during his earthly existence (Sharma, 2017).

We cannot afford the luxury of this vital disconnect of education with values as in the digital age; loss of values in professionals and knowledge workers could lead to misery and long-term sufferings to the society globally, as have been witnessed during the pandemic. University education thus, should focus on the troika of *Capabilities, Competence and Character* to produce an army of responsible citizens that shall create levels of sustainable prosperity and happiness together.

Let the schools, colleges and university reaffirm their resolve to join in with the national efforts of transforming our great republic to a vibrant, developed and prosperous country, inhabited by responsible citizens, exhibiting the highest respect for human values, personal integrity and professional ethics akin to the modern digital age, and make Mother India proud of its higher education and research. India can truly lead the world in this respect, as truthfulness, integrity, harmony, compassion and peace are in high demand, and also the strongest currency of the global human society.

Conclusion

With the rapid advancement of science and technology, and the deep penetration of technology-assisted modern systems and applications in a globalised knowledge society, the value and worth of universal ethics, professional morals and personal integrity of the citizens at all levels have assumed higher importance to ensure inclusive development and to touch the highest alters of human excellence. With the easy access to vast knowledge base and the ease of using connectivity and social media, we are currently on the brink of a manmade disaster on the one hand and a gold mine of opportunities on the other, to build a prosperous and happy global society. Professional societies, industries and chambers of commerce, the academies and global bodies such as the UN should have a major role in enforcing work ethics and professional morality of its members. The time may be right to formulate global standards for universal human values, ethics and professional morals, say an ISO 10000, and make it mandatory for global citizens for global mobility, global trade and business. The society and the government undoubtedly have an impacting role in enforcing well-defined codes of ethic, scientific and corporate values, and personal and professional morals so as to create responsible citizenship as also to support the sustenance of a fair and just global society.

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Quality Education : A Modern *Mantra*

Shivraj B Nakade*

Quality education is a modern *mantra* throughout the world. Main aim of education is all-round development of 'body, mind and spirit' of the student. Education facilitates creativity, spirituality, character building, cultivation of moral and ethical values, development of skills and makes students capable of critical thinking and discovering new ideas. It enables students to pursue their academic career with devotion, dedication and determination. All this is possible only when the educational institutions are sincerely fulfilling the purposes of creation, dissemination and promotion of quality education.

Reforms in education are being carried out time to time in India. Many changes also have been taking place accordingly. In modern period, Information and communication Technology has brought revolutionary changes in the lives of people. In order to conform the Indian higher education system with the latest developments, the Central Government has launched the new National Education Policy in 2020. Its aim is to make "India a global knowledge superpower." Implementation of new education policy with sincerity and honesty will transform the living standard of the people. It will enable the educational institutions to create and disseminate knowledge and cater to the academic needs of millions of aspiring Indian youth. The intention of National Education Policy is to create '*Atmanirbhar Bharat*'. In the new policy, importance is given to the use of technology. Technology is an engine of power and change.

With the new developments, old methods of pedagogy, teaching and learning are getting replaced and reformed. Information Technology is bringing drastic changes in the domain of education. The use of new devices of technology are paving way for 'establishment of digitally empowered society.' The old system of education that has been providing teaching and training to students has not produced

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desired results in making the students capable to lead the change and to render service to humanity. In this scenario, technology is providing new means, methods and solutions. Innovative ideas, time, space and speed have gained importance.

There is a great demand for tech tools and equipments which people never thought of in the past. New modern tech products are intelligent apps, robotic process, automation, automatic computing, wearable computing, ambient intelligence, artificial intelligence (AI), internal augmented reality (AR), internet and block chain technology. These tools have brought revolutionary changes in the world. They have been accelerating development of the fourth Industrial Revolution in the world. Technological advancements and tech firms have played an important role in making major nations powerful especially the U.S. and China. Developed nations are willing to use new emerging technologies to increase their power to play role in 'geopolitics and geo-economic fields.'

Primary Education

Primary education is the important stage of formal education by which young students acquire ability to read and write and capacity to grasp basic addition and subtraction of numerals. Main goal of new scheme '*Samagra Siksha*' launched by the government is to strengthen universalization of primary education and provide liberal access to schools. One of the main aims of new education policy is to give priority to foundational literacy and numeracy to the students.

The government has declared the launch of National Initiative for Proficiency in Reading with Understanding and Numeracy (NIPUN) Bharat Mission. Recommendations of the policy visualize that national mission will promote holistic approach and involve all stakeholders for achieving the goals of primary education. There is also an emphasis on regional language mediums for education. But some educational experts have criticised the new policy of having regional languages as medium of instruction at primary stage. However, the teaching

of English language at primary level is to be encouraged.

Higher Education

National Education Policy has put emphasis on the promotion of quality and interdisciplinary education, and also gave utmost importance to research and development in higher education. New changes are recommended in the structure of the Higher Education Institutions as well as provisions have been made for interdisciplinary curriculum for students. New policy envisages colleges or Higher Education Institutes (HEI) academically powerful units to become Autonomous Institutions for giving degrees. Existing colleges which are not academically and financially viable will be merged into other academically sound Institutions. Higher Education Institutions will have full autonomy in the areas of teaching, research, setting curriculum as well as collaboration with foreign institutions.

Each institution will have autonomy to select areas such as research or teaching or mix of both in addition to regular promotion of quality education. Focus is on the promotion of quality higher education as well as research and development. Undergraduate and postgraduate students will have options to take interdisciplinary and multidisciplinary courses. The undergraduate and postgraduate courses are of four years and two years degrees respectively. Vocational education has also been included in the new policy. Students will be able to do work independently and after completion of degree courses or professional, vocational courses can become torchbearers of change. They will be programmatic in adopting and practicing the principle of 'local, vocal and global'. The government's policy is to encourage and give full support for transformation of colleges into autonomous colleges on large scale. Such valuable policy will not only reduce the burden of universities which provide merely degrees but also enable them to function as research and development centers.

Teacher is the key person who plays an important role in teaching, guiding and developing career of the students. Teaching tools such as audio, video, internet, smart phones, computers will be handy and helpful to the teachers, such able teachers can be collaborating with their students, peers, regulators of educational institutions and can connect themselves with other educators in the world. All of them may be able to improve the standard of teaching, learning and research and can contribute their innovative ideas for the establishment of knowledge society.

A new body, National Educational Technology forum is projected by the central government which offers new technology platform for exchange of innovative ideas and improve the process of planning, learning, teaching, assessment as well as administration of educational institutions at school and higher education levels. The central authority of government has also decided to start a novel institution called the National Research Foundation (NRF) in order to improve research in the field of technology and to provide a platform for intensive research especially in Artificial Intelligent, Argumented Reality, (AR) voice-recognition, face-recognition. This new institution will also pay attention to improve research in social sciences, arts and humanities so that career of students and researchers can be shaped properly on the basis of the rationality to serve humanity.

Online and Offline Teaching

Technology offers very easy methods for online teaching and learning. It is very easy to conduct virtual classes. At present most of the states in the world are favouring online teaching and learning for the students. Recently, after COVID-19, online teaching and learning has become very prominent in India. But the new methods of conducting classes on the basis of modern tech tools are more favourable to rich and middle class people. Poor and financially weak students may not be able to have devices to study online at their residence. Thus, there are some drawbacks also in online teaching. Live debates and discussions between the teacher and taught will be marginalized. There is no individual attention towards the students in virtual classrooms.

Efforts will have to be made in finding out solutions to remove drawbacks of online teaching learning and assessment of students. India is unique country having rich demographic dividend of population of 15 to 30 years of age. It is a rich human resource. Why not to reap this rich human resource by giving proper education and training.

Live debates discussions and interaction will continue in classroom.

Conclusion

NEP—2020 pays special attention to quality education and research to provide holistic, ethical and value based education. New emerging technologies –AI, 5G and Internet of Things (IOT) are also given due importance in the field of higher education. While taking into considerations the present scenario of the world, the Indian government should implement the new education policy immediately as per the schedule. In the age of reason and technology people have to be collaborative with one another to shape the career of the students to ultimately make *'Atmanirbhar Bharat'* and also contribute to make the world safe, secure, peaceful and prosperous place to live in.

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Increasing the Reach and Expansion of MOOCs: A Critical Study

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As per the World Bank, between 2008 to 2016, on an average 6.3 new tertiary education institutions were established per day (including Sundays and other holidays) in India (World Bank, 2016). The average growth rate of tertiary education institutions now is 78% with student enrolment growth of 109 % which is very high in comparison to most of the countries (UNESCO, 2015, World Bank 2016). World's largest young population lives in India and to suffice their requirement, a number of higher education institutions (HEIs) were established of late. This brought a boom of HEIs in the country. But, at still the problems of equitable access and quality remained a cause of concern for higher education (HE). As per the world bank, still there is huge disparity in access to HE among the economically poor and geographically remote students. To bridge this gap of equity, access and quality in education, Massive Open Online Courses (MOOCs) were created in the country.

Thus, the rising tide of digital learning has captured India with MOOCs like Study Webs of Young Aspiring Minds (SWAYAM). SWAYAM are the digital learning initiatives by Ministry of Education (MoE), erstwhile Ministry of Human Resource Development (MHRD), Government of India which became the game changer in revolutionizing the education at both national and international levels (Semalty A., 2019). The New National Education Policy–2020 has also given

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huge impetus to MOOCs and OERs. MoE and all the national coordinators (NCs) of SWAYAM are putting all their efforts, time, resources and money for success of SWAYAM MOOCs as the *Brahmastra* of digital learning in India (Boxall, M., 2012).

The SWAYAM MOOCs are becoming very popular. But still a lot more need to be done for the quality growth and effectiveness of MOOCs. Keeping this in view, a critical study of 156 SWAYAM MOOCs was conducted to see their performance and effectiveness. The data was critically analysed in the study and possible factors for improving the learner's engagement and overall quality/ learner's acceptability were pointed out. The study proposed strategies for improving examination registration and to conduct effectiveness audit of MOOCs.

Study Design

A total of 156 SWAYAM MOOCs from 3 national coordinators (UGC, CEC, and IIMB)of July- October 2019 cycle, with a total of 4,53,488 enrolled learners of SWAYAM were taken for the study. In Phase 1, enrolments and examination registration were observed for all the MOOCs and the examination registration to enrolment ratio (individual/ average) were calculated. Top 50 MOOCs irrespective of National Coordinators were also studied. In the Phase 2, the MOOCs of UGC were studied with respect to the result of the SWAYAM MOOCs. Descriptive statistics was used to understand the data with a focus on the pattern and trend of the learner's engagement. In the Phase 3, the study proposed strategies for improving examination registration and to conduct effectiveness audit of MOOCs.

Results and Discussion

Total enrolment and examination registration were studied in all the courses (Fig. 1). For obvious reason (due to maximum number of courses) CEC had the maximum number of total enrolments followed by UGC and then IIMB. But in the average

enrolment per course, IIMB ranked first followed by CEC and UGC (Fig. 2). On the other hand, in examination registration per course UGC MOOCs ranked first followed by IIMB and CEC.

The average examination registration to enrolment ratio were observed for all three National Coordinators (NCs) (Fig. 3). UGC (with 43 courses) ranked number 1 in average examination registration to enrolment ratio (7.02 %) followed by IIMB (22 courses; 4.96 %) and CEC (91 courses; 3.63 %). The gross examination registration ratio for the national coordinators was 6.3, 5.44 and 3.43 for UGC, IIMB and CEC.

Therefore, UGC and IIMB complied with the general international average of 5-7 % examination registration in MOOCs. Besides this, Top 50 MOOCs in examination registration were also studied, irrespective of National Coordinators (NCs). In the top 50 MOOCs as per exam registration, with a maximum of 20 MOOCs, UGC MOOCs ranked number one. Moreover, the top 3 MOOCs were of UGC only. A total of 4 courses of UGC were there in top 10. CEC turned up with 15 MOOCs in the top 50 with 3 MOOCs in the top 10. While IIMB came up with 12 courses in the list with 2 courses in the top 10. The UGC MOOC "Academic Writing" ranked

number one in examination registration with 1,472 ie 12.08 % exam registration ratio.

In the Phase 2, the UGC MOOCs were focused. The result of the UGC MOOCs were studied critically. The result data from all 44 courses of UGC was compiled (Fig. 4) and top 10 courses based on the number of candidates appeared in the proctored term end examination were shown in the inset graph. Academic writing was in the top place in both the markers: learners appeared in the examination and the average marks obtained in the proctored term end (external) exam. "Introductory Sanskrit Grammar" had the highest score in average internal marks given. The course topology had the minimum scoring in both average external and average internal marks. Even though a large number of learners appeared in the external examination, academic writing showed outstanding average scoring (92.31%) which reflected the qualitative learning among the learners.

The result of the top 10 courses based on learners appeared in the proctored term end examination was divided into three categories, fail, pass and outstanding (Fig. 5). Learners, having a final score <40% were placed under the fail category. The learners who obtained 40-75% marks

Fig. 1: Total Enrolment and Exam Registration for 3 National Coordinators
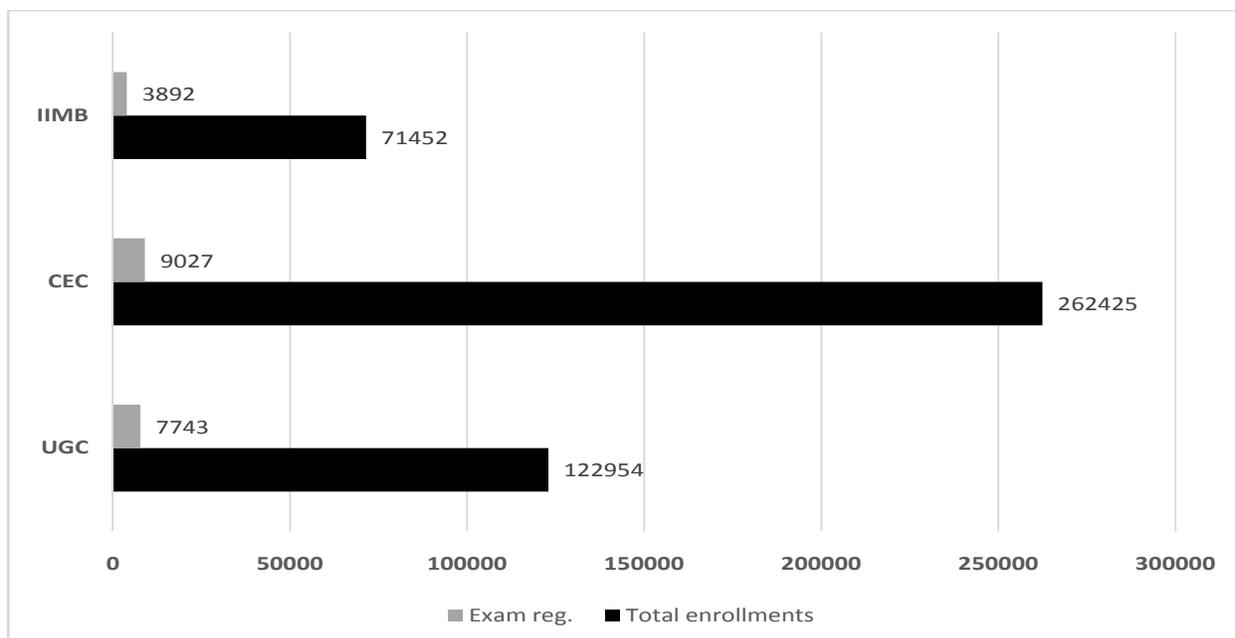
Fig. 2. Average Enrolment and Average Exam Registration per Course
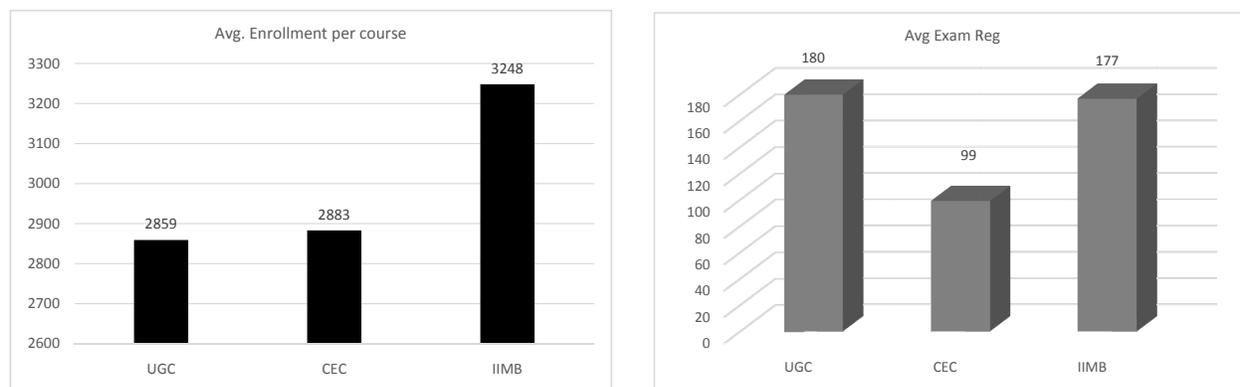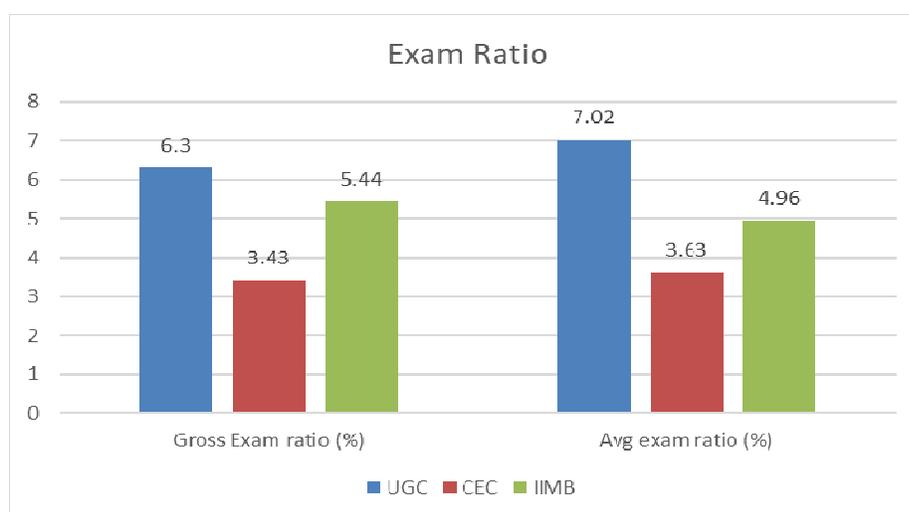

**Fig. 3: The Average Exam Registration to Enrolment ratio for three NCs**

in the final score were considered pass. Learners having >75% scoring in the final result were placed under the Outstanding category. The course "Goods and Service Tax" had no student in the fail group. "Academic writing" had the highest number (84.94%) of learners in the Outstanding group. The "lowest number of learners in the fail group" or the "highest number of learners in the outstanding group" could be considered as a good representative of learning. "Introduction to computer network and internet protocol" had the highest number (14.45%) of learners in the fail group followed by the digital marketing MOOC with 11.50%. The result data of all 44 courses were also categorised in these three groups: fail, pass and outstanding (Fig. 6).

The categorisation graph reflected the clear picture of the number of learners appeared in examination v/s total marks obtained. It suggested the necessary inclusion of consideration of the number of learners appeared in proctored term examination for the impact assessment of any MOOC. This is to keep in mind that considering only the average or highest-scoring, learners would not give the complete picture. For example, if any course has less number of participants and one of them scores the highest among all the learners from different MOOCs, in such case, the course will have the topmost rank in the list (just due to top score). But this will be a failure as it would not express the actual status of learning through MOOC. In another set of analysis, the results were clustered in four quadrants using average internal marks and average external marks using as parameters (Fig. 7).

The courses were distributed in four clusters

Fig. 4: Average Marks of All UGC MOOCs and Number of Candidates Appeared for Exam for Top 10 UGC MOOCs (Inset)
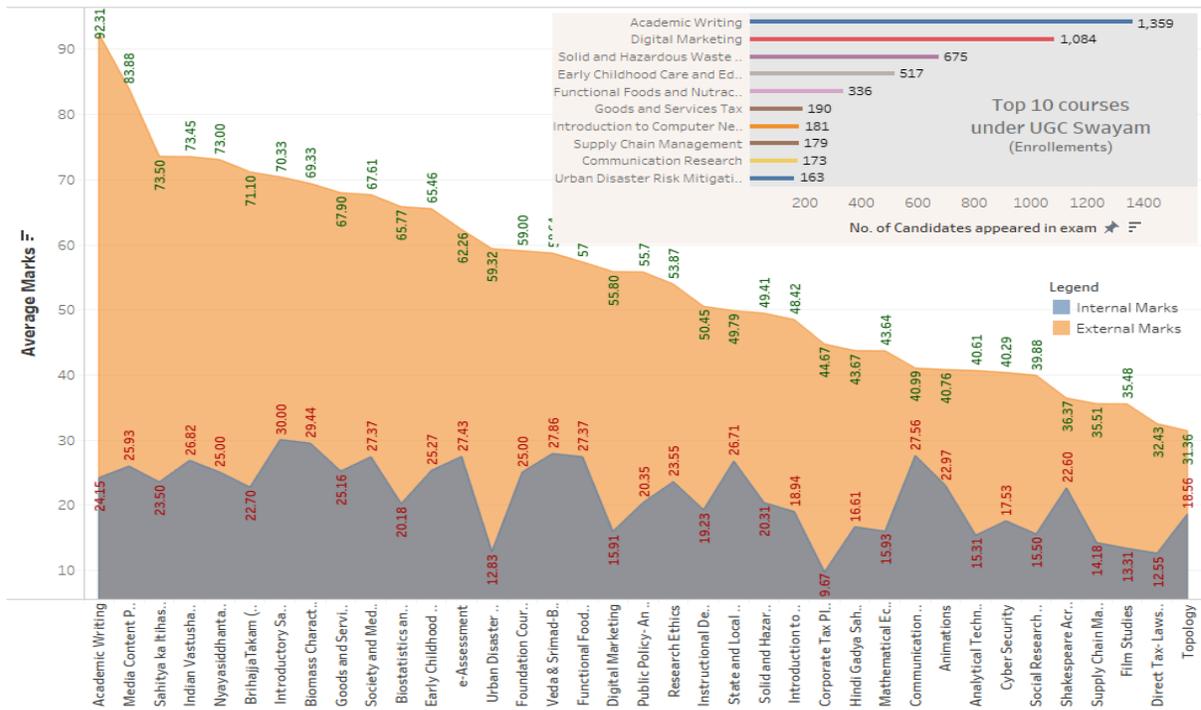
among which the first cluster was based on low average internal (<15) and low average external (<50) marks with a suggestion of "Instructional design improvement needed". The first cluster included four courses. The second cluster was based on a high average internal (>15) and low average external (<50) marks with a suggestion of "Content dissemination improvement needed" and it was

observed that there were 17 courses in this category. In the third cluster, only two courses were there which was based on low average internal (<15), and high average external (>50) marks suggesting a "Better engagement strategy to be implemented". The last cluster was a "balanced one" with high average internal (>15) and high average external (>50) marks including 20 courses.

Fig. 5: Analysis of Result of top 10 UGC MOOCs
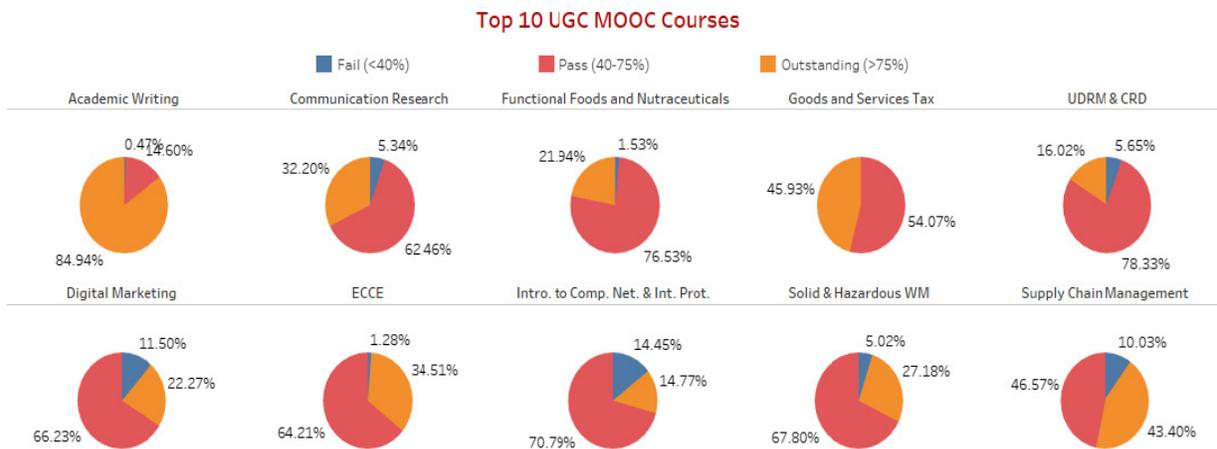
Fig. 6: Analysis of Result of all UGC MOOCs
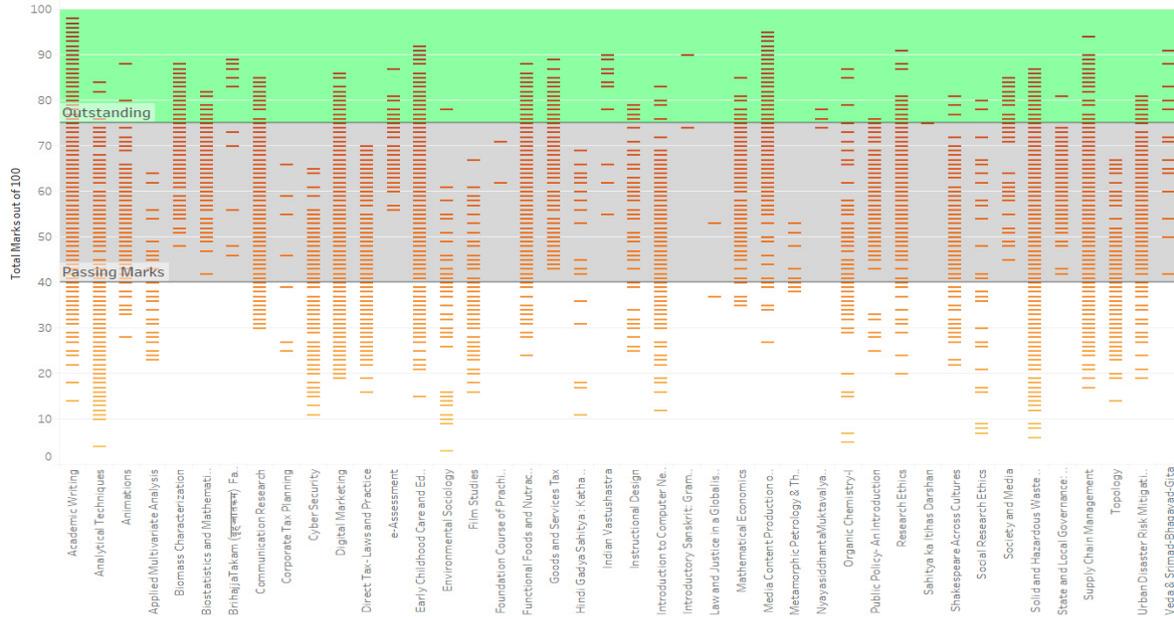
At the last, the SWAYAM MOOC "Academic Writing" with more than12,500 learners from more than 85 countries were studied. Though UGC MOOC "Animation" was having the maximum enrolments, "Academic Writing" MOOC showed maximum examination registration. Figure 8 showed the participation of learners in SWAYAM MOOC course Academic Writing from various states of India.

Tamilnadu, Maharastra and Karnataka were the top three states for the enrolment in this particular course. The data also helps in the understanding of the fact that in South Indian states the awareness for MOOC and online courses is higher in comparison with that of the north Indian states. It can also be concluded from the data that the area and the population of the state are insignificant factors for the enrolment in the course while the urbanisation,

Fig. 7. Cluster Based Analysis of Results of UGC SWAYAM MOOCs
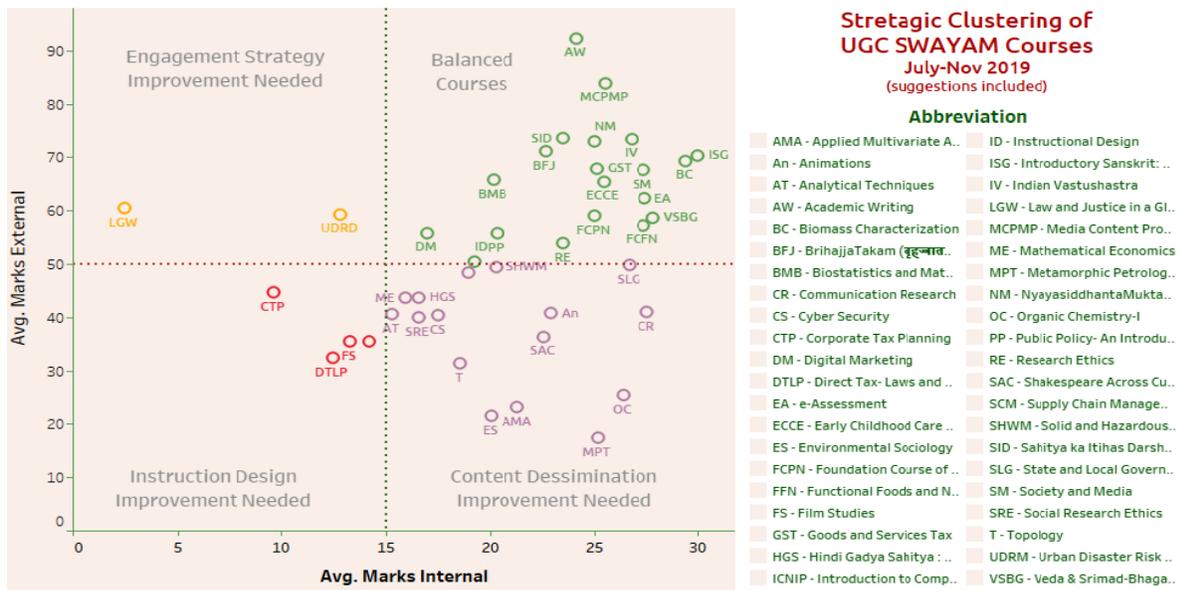
resource availability are the most significant factors to be focused for increasing the enrolment numbers (McCulloch et. al., 2014; Pilli et. al., 2018).

The course focused on various learner centric models, used the live interaction frequently (more than 7 live interactions with learners), used the discussion board effectively and had very engaging and natural video modules. Moreover, further links were very much used with due caution and selection. As supported by the previous discussion (Fig. 4-7), these factors were well indicated by the positioning of Academic Writing Course as a balanced Course with the maximum examination registration, the best

performance in external examination and outstanding average scoring.

To assess the learning, further analysis of academic writing learners was done. Based on their internal and external marks, all the learners of "Academic Writing" course final exams were clustered in four categories (Fig. 9): weak learners (0.6%), slow learners (4%), non-consistent learners (10.4%) and balanced learners (85%). Therefore, the course had the maximum number of balanced learners.

To further assess the learner's engagement of learners in the "Academic Writing" MOOC,

Fig. 8. Geographical Distribution of Learners in the SWAYSM MOOC "Academic Writing"
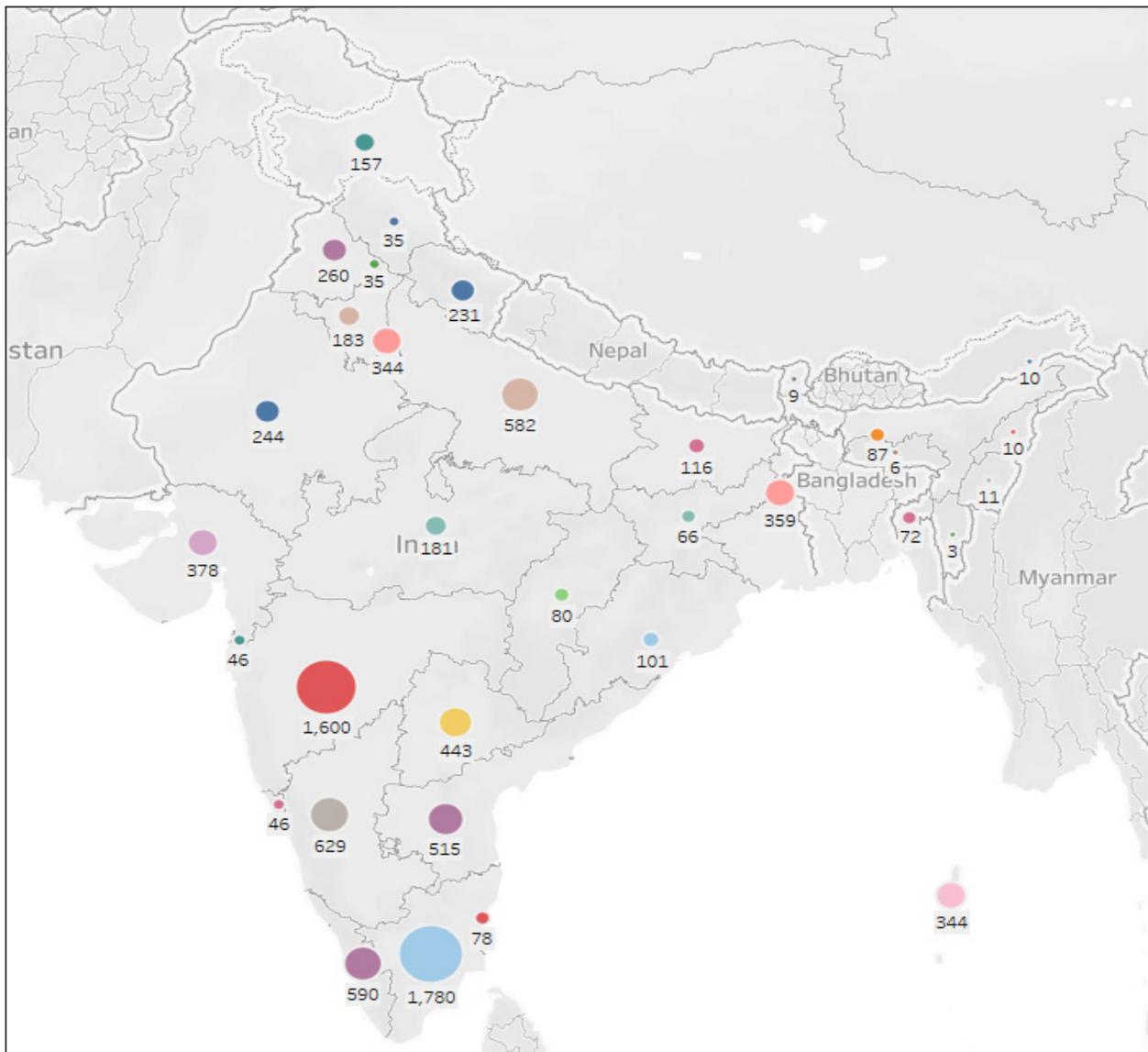
YouTube channel viewership data was collected and studied. Top 20 videos with the highest viewership v/s number of views were put together to generate clearer picture (Fig. 10). Total watch time for the YouTube channel was about 13,613 hrs. approximately with an average of 05 minutes and 14 second view time on the single sitting by any viewer. The viewership data showed that with the progression of the course towards its completion, it is challenging to engage the participants in contrast of the beginning of the course. This issue could be rectified by incorporating learner centric tools like Learning by Doing (LbD) activities and increasing engagement in the discussion forum (Bergner, et. al., 2015; Wang et. al., 2015).

Data from course discussion forum was also collected. This included forum activity, on month basis, in two parameters i.e. posts and topics. The data covered course duration from June 2019 to December 2019, till the announcement of the results. In all the active months (July to November) at least 200 topics were discussed with a minimum of 350 posts each month. November 2019 got highest activity with 568 topics and 765 posts (Inset of Fig. 10). The highest engagement of learners in discussion forum in the last month may be obvious due to examination registration etc. But over the engagement through discussion forum was very effective during the course with value added feature of pre and post course discussion forum support to the learners.

The Proposed Strategies

On the basis of the study, some strategies are being suggested to improve examination registration and to conduct effectiveness audit of MOOCs.

Identifying/ Developing the Need-based MOOCs

We should always accept that MOOCs are not the first priority of the learners, except for very few who want to update themselves in their respective areas. So, need based online courses should be encouraged rather than going for very specialized subject specific super specialization courses. The target learners must be well identified and the efforts of engagement should be focused on them (Qui et. al., 2016; Zheng et. al., 2015). Authors appreciate the steps taken by Ministry of Education, UGC and

Fig. 9. Cluster Based Analysis of Result of Academic Writing MOOC: 4 Types of Learners*

Weak learners: with low internal (<15) and low external (<50) scores; Slow learners with score>15 in internal and score <50 in external exams; Non-consistent learners with score <15 as internal and score >50 in external exam; Balanced learners with score>15 in the internal and score>50 in the external exam.
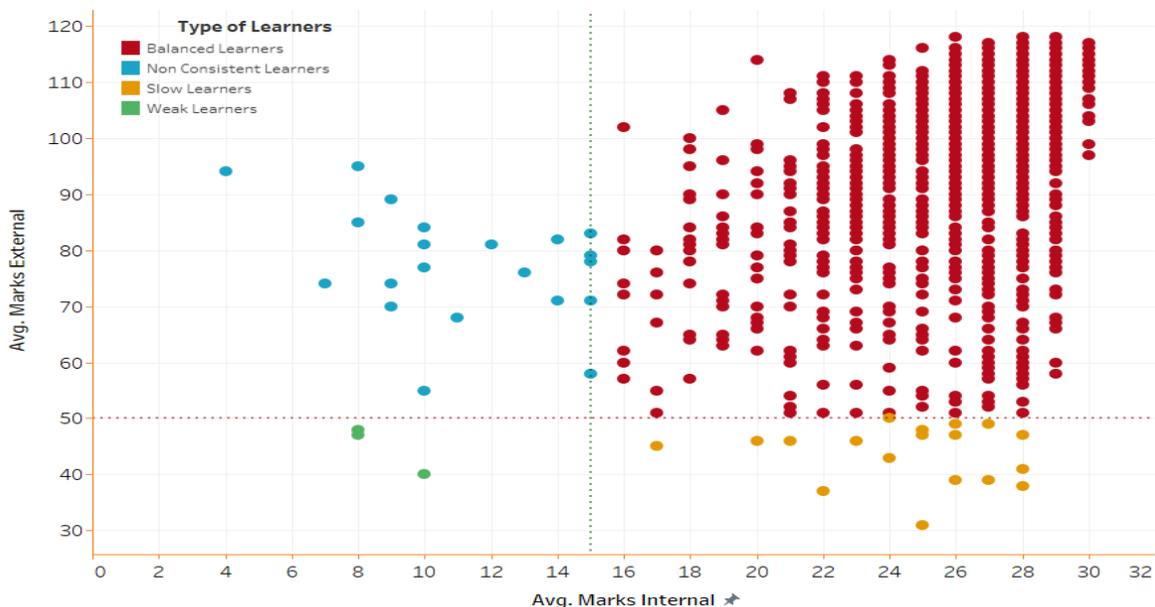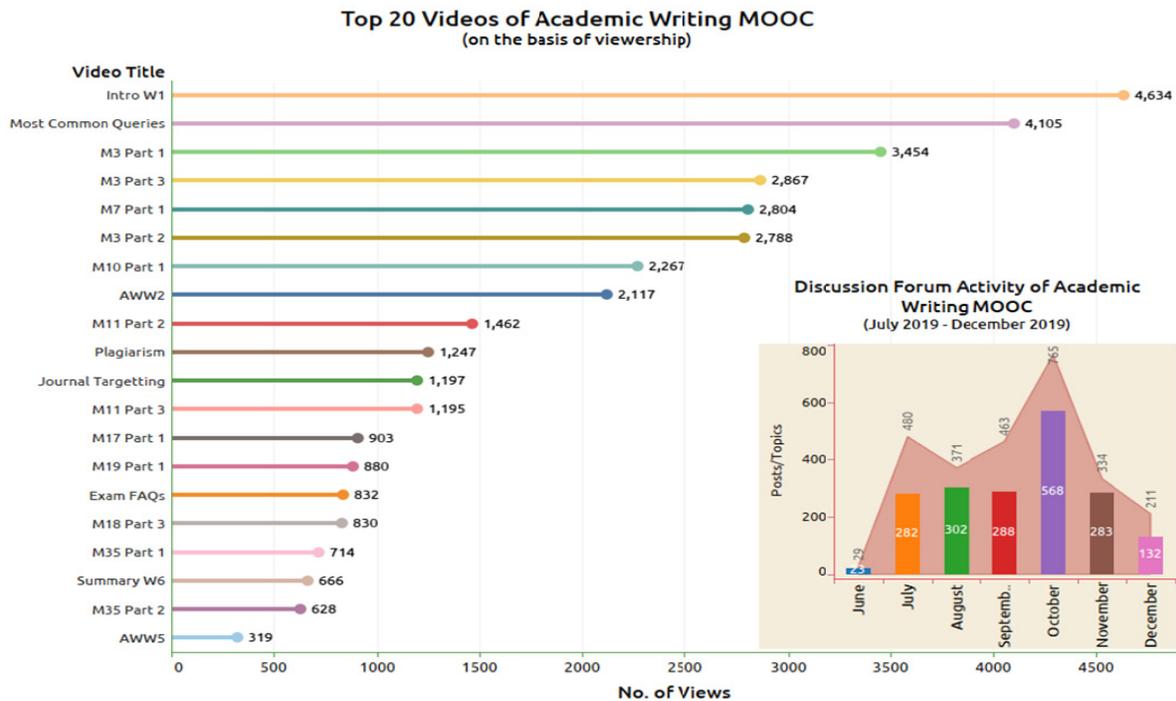
Fig. 10: Analysis of Viewership and Discussion Forum Activity of Academic Writing MOOC

CEC for mapping the courses and identifying the subjects where the MOOCs are much needed.

Grooming the Faculty for MOOC Courses

Developing online courses and running it with entire positive energy is a big job. Course coordinators should be given due recognition. Training of MOOC development is utmost necessary because the faculty members know how to teach but delivering the content in the digital platform or the MOOCs needs an entirely different pedagogical expertise. The aspects like Gagne's nine events of instructions, Bloom's taxonomy etc. (Gagne, 1992, Adams, 2015)should be exposed to the MOOC developers. The efforts of Ministry of Education (MoE) and the National Coordinators for Organizing Advanced Training Workshops on Developing MOOCs in IIM Bengaluru and NITTTR Chennai have been very successful. This acquaints the course coordinators about the basic concept of developing more engaging and successful MOOCs (Turkle et. al. 2017).

Awareness Campaign among the Faculty and Students

Students and faculty members in colleges and universities are unaware about SWAYAM courses and credit transfer, by and large. Students at many universities and private institutions are completely unaware of even SWAYAM platform. Government of India through MoE has invested a lot of money in developing and preparing SWAYAM platform and MOOCs but the awareness and promotion of SWAYAM MOOCs need to be looked upon for successful acceptance of SWAYAM courses by the students. This is all the more importance in this COVID -19 phases when universities are working online. The response of the aware areas and regions in term of enrolment and examination registration in SWAYAM MOOCs, is self-evident (Dennen et. al., 2013; Kaushik, A., 2018).

Institutional Willingness to Accept (WTA)

In-spite of the immense efforts of MoE and UGC, in motivating Universities and institutions, for taking MOOCs for credit transfer the desired results are yet to come. For lot many reasons institutes are not turning up for taking MOOCs for credit transfer. A major factor, as the author experienced, is the unawareness about the concept of SWAYAM MOOCs at the authority level. Institute authority must also be informed or prepared through one- or

two-day workshop at regional level (Gedeon, J.A., 2014; Griffiths et. al., 2015). The other reason is the financial one. Many students see the MOOCs as an extra financial burden, especially when they have to pay the registration fee and to go to the exam centres which sometimes are quite far from their place of residence. Technically the students are paying the fee for the paper twice, once to the University and then to SWAYAM. This must be sorted out specially for the students who are going for credit transfer through SWAYAM MOOCs. The examination centers must also be provided in the same institute like IGNOU Model.

Focus on Developing Engagements

Having content expertise is not the guaranty of developing and running a successful MOOC. It needs more efforts in delivering the content in engaging and effective way. The engagement of students can be enhanced by adopting the engagement strategies (Murthy et al., 2018, Sahasrabudhe, 2016, Hew 2016) like LxI -Learner experience interactions, LbD-Learning by doing, LxT-Learning extension trajectories, LeD-Learning dialogue (Do et. al., 2013) and by focusing the serious efforts in running the discussion forum throughout the course.

Have Balance between Technical Jargons and Practical Approach

Though technical terms and aspects have their own importance, the educators or instructors must not forget the fact that they are the master of their own class and subject domain. Course instructors should invent and find their own practical approaches to make things easy to communicate and presentable. So, the orchestration or engagement tools must be used wisely. The fact: "Tell to inform, not to impress" should be practiced (Semalty, M, 2019).

Effectiveness Audit

MOOCs effectiveness audit must be planned with consideration of all vital factors discussed in the study. These include demand of course, credit transfer, learner's engagement tools, threads of discussion forum, live/ lively interactions, easy and effective approach etc. The rubrics may be defined for each factor and the NCs must do the audit of effectiveness of MOOCs. The audit report should be well discussed, and the remedial strategies must be planned for every rerun of the course (Peng & Xu, 2020, McGreal et. al., 2013). Also, the budgetary provisions must be made to improve and update the MOOCs in rerun.

Conclusion

The study concluded that UGC MOOCs performed very well among the SWAYAM MOOCs under study. The efforts must be made, studied and analysed for improving the examination registration and overall engagement in MOOCs. Serious efforts are needed in developing and running MOOCs in leaner centric mode. The well-designed rubrics for effectiveness audit of MOOCs may serve as the basis of continuous quality assurance of MOOCs and may be helpful in increasing the reach and expansion of SWAYAM as well as other MOOCs.

Acknowledgements

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The Continuous Pursuit of Knowledge Leads to the Path of Progress

Ram Nath Kovind, Hon'ble President of India delivered the Convocation Address at the 41st Convocation of the Anna University, Tamil Nadu on March 11, 2021. He said, "Knowledge is the foundation upon which the character of each individual is built. I have said earlier and would like to reiterate that education is the catalyst for change and the youth is the most potent agent of social transformation. Educated youth, given the right direction can bring revolutionary changes in the course of history." Excerpts

It is indeed a pleasure for me to stand here among the enthusiastic students on the occasion of the convocation ceremony of this prestigious university. My heartiest congratulations to my young friends who have received their degrees today, especially to those who have won medals for their meritorious performance and academic excellence.

Anna University is blessed to be located in this land of Tamil Nadu which has been the cradle of knowledge and learning since times immemorial. The long literary tradition spanning over centuries in the form of Sangam Literature is a matter of pride for all Indians, as it symbolises the rich cultural heritage of our country. The anthologies of poems from this literature have been universally appreciated by readers and scholars alike. With the antiquity of texts embodied in its ancient literature, it is not surprising that Tamil language has been accorded the status of classical language.

Ladies and Gentlemen, Knowledge is wealth, and it is the best among all forms of wealth. As the famous saying elaborates that it cannot be stolen by thieves, cannot be seized by kings, cannot be divided amongst brothers, and it is not heavy to carry either. The more it is spent, the more it flourishes. The wealth of knowledge is therefore, the most important among all kinds of wealth.

Knowledge is the foundation upon which the character of each individual is built. I have said earlier and would like to reiterate that education is the catalyst for change and the youth is the most potent agent of social transformation. Educated youth, given the right direction can bring revolutionary changes in the course of history.

That is what the National Education Policy 2020 aims to achieve. Last year, I had the opportunity to discuss with the Visitors and Vice Chancellors of the central universities and higher education institutions, the educational scenario in our country and the implementation of the new policy. The new policy seeks to implement a modern education system based on research, skill and acumen relevant to the evolving needs of the present. At the same time, it would also include within its domain our rich cultural heritage in consonance with a futuristic outlook. The policy focuses on inculcating moral values and promoting understanding of Indian culture. I am confident that the implementation of this policy would usher in an era of modern learning and education. It will create a brigade of researchers and professionals who would take our country to the great heights of development, as befitting our national aspirations.

It is heartening for me to know that today I stand in a university which is the hub of technological education. It is one of the largest technological universities in the world, offering undergraduate and postgraduate courses in Engineering, Technology, Architecture and Applied Sciences relevant to the current and projected needs of the society. I am told that the oldest college of this university made humble beginnings in the form of the School of Survey in the summer of May 1794. Over the years, it became the famous Guindy College of Engineering which celebrated its 225th anniversary last year. From those beginnings has grown a large cluster of excellent academic institutions which has four university department campuses, 13 constituent colleges, three regional campuses at Tirunelveli, Madurai and Coimbatore, and over 550 affiliated colleges. Not only in numbers, but in quality too, the Anna University making an impressive contribution in the field of education sector. That is why it figures among the top institutions in QS World and NIRF rankings.

Even the number of the students has drastically increased over the years. What is more encouraging is that this university has been witnessing gender empowerment through education and it shows in the number of women students at this university. I am told that more than one lakh candidates at undergraduate, postgraduate and PhD levels are receiving degrees today of which about 45 percent are women. It was a bigger pleasure for me to know that out of total students being conferred with gold medals and first-class degrees today, more than 60 percent are women. I am told that out of 66 students being conferred gold medals, 42 are our daughters and further out of 13 students, I just gave gold medals to, I noticed nine are girls. This shows the lead being taken by our daughters in our society. This excellence displayed by women is a reflection of the future of India as a developed nation. I congratulate each one of these daughters for this accomplishment, which is just a stepping stone on the path of further progress, both academic and personal.

Anna University has created a conducive ambience for encouraging technological pursuits that cultivates the right learning attitude for the young students. The scientific temper that is nurtured in the students is well expressed in the projects and achievements of this university. I am glad to note that this is the first Indian university to design, develop and operate a satellite in association with ISRO. Named ANUSAT, the satellite is not just an achievement but also an inspiration for young minds across the globe to open up and reach for the stars.

Ladies and Gentlemen, It is an honour for me to come to Anna University as my esteemed predecessor, Bharat Ratna Dr. A. P. J. Abdul Kalam, was also an alumnus of this university. The Government of Tamil Nadu has done well to have instituted an award named after him. This university has produced icons like Dr. Verghese Kurien who literally engineered a great social transformation through milk cooperatives. As the driving force behind the White Revolution, Dr. Kurien will always be remembered as one of the foremost social entrepreneurs of modern India. Such illustrious alumni of this university remain sources of inspiration, not only for all of you but also for all students everywhere.

We in India believe in promoting knowledge for the benefit of all. I am reminded of the great poet, Subramania Bharati, who wrote:

"Our country India is blessed with complete knowledge, It is this place where resides the compassion of Gautam Buddha."

It is this compassion combined with knowledge that helps a nation march ahead on the path of progress while promoting a culture of caring. I am confident that all the students receiving degrees today will walk this path in their life ahead and make their alma mater and our country proud.

My young friends today are on the threshold of beginning a new journey. Some of you would be pursuing higher studies while others may take up professional responsibilities. But always remember that it is your deeds that will reflect your personality. Always try to give back to your family, society and country which have nurtured you in the most significant phase of your life. I am sure that you will never step back from putting in your best.

I extend my best wishes to the students. I also congratulate their families who have worked hard to bring each one of them thus far in their journey of life. I also appreciate the faculty and administration on this occasion for their contribution.

Thank you,
Jai Hind!

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CAMPUS NEWS

International Webinar on Quality Concerns in Education and Educational Research

A three-day International Webinar on 'Quality Concerns in Education and Educational Research' was jointly organized by the Department of Education, The Gandhigram Rural Institute (GRI),Dindigul, Tamil Nadu and All India Association for Educational Research, recently.

Dr. Ponnusamy, Assistant Professor, Department of Education, at the outset of the programme, explained the history and legacy of The Gandhigram Rural Institute and joint effort taken by AIAER in collaborating with GRI for the successful conduct of the webinar. Dr. A Jahitha Begum, Professor and Head, Department of Education, GRI welcomed the gathering and briefly touched upon the need of the Quality in Education and Educational Research. Dr. William Baskaran, Dean, School of Social Sciences, GRI delivered presidential address of the webinar discussing the quality of Education, Educational Research and the new perspective of educational research. Dr. Sunil Behari Mohanty, President, AIAER stressed on Quality Research Reporting, Research Publications in indexed Journals with high quality and Need of Interdisciplinary Research. Dr. P S Sreedevi, Assistant Professor, Department of Education, GRI proposed the Vote of Thanks.

Prof. Manjula Vithanapathirana, Resource Person, Department of Educational Psychology, Faculty of Education, University of Colombo, Sri Lanka delivered a lecture on 'Buddhist Psychology Perspective for Educational Research'. She compared Buddhist Psychology with Western Psychology and highlighted cognitive aspects of Psychology for wellbeing, intervention research as practice based research, importance of interdisciplinary research paradigm, action research, etc. The concluding remarks of the session was delivered by Dr.Ponnusamy Assistant Professor, Department of Education, GRI.\

During the Technical Session, Dr. A Jahitha Begum, Professor and Head, Department of Education, GRI welcomed the gathering and introduced the Resource Person of the session, Prof. Margaret M Solomon, Professor of Education and Leadership, La Sierra University, USA. The resource person delivered her lecture on 'What is Good Research and How to do Good Research? She drew the attention on what is research, four types of knowledge, Theoretical explanation of research, Methodology and problem as deriving force for research, genuineness of giving empirical finding of the research, Research for justice, equality and social change. The session ended with the concluding remarks given by Dr. R BagdhaVachala Perumal.

Dr. K Thiyagu, Assistant Professor, Central University of Kerala threw light on 'Required ICT Tools in Terms of Its Usage to Research Scholars and Teaching Fraternity'. To mention a few ICT tools like lens.org, Mendely, Zotero, Easy Bib, Endnote, Google scholar button, Microsoft forms, Refine, Evernote, Google assistant, etc. He elaborately explained the various softwares useful in research. He provided the active webpages of softwares. A very good hand on experience was given to the participants. Dr. R BagdhaVachala Perumal concluded the session.

Prof. A Jahitha Begum, Professor and Head, Department of Education, GRI delivered the lecture on 'Quality Concerns in Education and Educational Research' and stressed the ways to select appropriate research problem, nature of psychological variables and assessment, process of systematic research, required research skills, need for qualitative method in research, right attitude and trustworthiness in research, the importance of genuine reviews and genuineness in research reporting. The session came to an end with the concluding remarks of Dr. N Devaki, Assistant Professor, Department of Education, GRI.

Dr. Ravichandran, Associate Professor, Binary University, Malaysia focused on the theories of online teaching and different domains of educational experiences like social, cognitive, teaching presence and discussed the concept divides (Elements and Categories motivating and encouraging) by Garrison, Salmon's five-stage models, strategies to enhance students' participation such as independent networking, pedagogical approach, hybrid model and new pedagogical approach and symbiotic relationship along with appropriate resource, needs of policy makers, positive attitude, and critical approach. With the concluding remarks of Dr. N

Devaki the session was over. Dr. VPR Sivakumar, Registrar, GRI appreciated the effort taken by Department of Education, GRI and All India Association for Educational Research (AIAER) to conduct the event and the interested participation from different states of India and a few countries also and then the webinar ended formally with the vote of thanks proposed by Dr. M Deivam, Assistant Professor, Department of Education, GRI.

International Conference on Integrated Vehicle Health Management

A three-day International Conference on 'Integrated Vehicle Health Management' is being organised by the Department of Mechanical Engineering and Department of Aerospace Engineering BMS College of Engineering Bengaluru, Karnataka in association with the Vibration Institute of India, Indian Institute of Technology, Guwahati and Indian Institute of Technology, Patna on the occasion of 75th Year of the BMS college during December 16-18, 2021.The event aims to promote vital exchange of knowledge, ideas and information on the state of the art developments and applied technologies of concurrent machinery dynamics related problems in mechanical, automotive and aerospace domains. It will bring together researchers and practitioners from academia, research institutions and industry to exchange experiences, disseminate information, and explore new opportunities in this domain. The Topics of the event are:

- Composites and Nano-structures.
- Vibration and Acoustic Control.
- Signal Processing and parameter estimation.
- Rotor Dynamics.
- MEMS, Smart Structures and Systems.
- Compliant Mechanisms and Topology Optimization.
- Mini Power Trains and Unmanned Vehicles.
- Micro Turbines and Plasma Jet Engines.
- Vibration and Waves.
- Multi-Physics and Flexible Multi Body Dynamics.
- Wave Propagation.
- Non-Linear Vibrations.
- Guidance, Navigation and Control Technologies.
- Vehicle Dynamics.
- Probabilistic Models.

- Fluid Structure Interactions.
- Condition Monitoring and Machinery Diagnostics.
- Fracture, Fatigue and Damage Mechanics.
- Flutter and Aero Elasticity.
- Prognostic Health Management.

For further details, contact Organising Secretary, Dr Rudra Naik, Department of Mechanical Engineering BMS College of Engineering, Bengaluru-560019,Mobile No:+91 9449611692 E-mail:*vetomac2021@bmsce.ac.in*. For updates, log on to: *https://vetomac.com/*

Online Workshop on GAN Art

A three-day Online Workshop on 'GAN Art - Introduction to Generative Adversarial Networks' is being organised by the Department of Computer Science and Engineering, National Institute of Technology Calicut and AI Club, NIT Calicut during May 20-22, 2021. The faculty members, Ph.D. Scholars and PG Students from AICTE approved technical institutions may participate in the event.

Deep learning approaches are adopted widely in various fields, from healthcare to autonomous driving to everyday personal assistants like Alexa and Google Home. One topic that shook the AI community was Generative Adversarial Networks (GANs), which is capable of generating new unseen images of cats, humans, and many other everyday objects. This is an emerging area of Deep Learning which finds applications in art, developing dental implants, synthesizing CT from MR images, and many more. Through workshops and technical talks, the event may provide insights into the working of GANs and draw attention to some elements in human intelligence. It will be useful to students and research scholars to solve their research problems using GAN. The topics of discussion are:

- Introduction to Deep Neural Networks.
- Introduction to Convolutional Networks.
- Medical Image Synthesis
- Deep Learning with Python.
- Generative Models.
- Introduction to GANs.
- Types of GANs.
- Implementation of GAN (Hands on).
- Training GANs on GPU.

- Image to Image Translation.
- Applications and Case Studies of GANs.

For further details, contact Coordinators, Dr Jayaraj P B **OR** Dr Pournami P N, Department of Computer Science and Engineering, National Institute of Technology Calicut, NIT Campus P.O., Kozhikode – 673601 (Kerala),E-mail*: jayarajpb@ nitc.ac.in/pournamipn@nitc.ac.in/ganart@nitc. ac.in.* For updates, log on to*: www.nitc.ac.in*

Online International Multidisciplinary Conference on Research Methodology

One-day Online International Multidisciplinary Conference on 'Research Methodology in Library Science, Social Sciences and Commerce' is being organized by the Library Department and Internal Quality Assurance Cell, Anandibai Raorane Arts, Commerce and Science College, Sindhudurg, Maharashtraon May 27, 2021. The Conference aims to bring together the faculties, researchers, scientists, stakeholders and practitioners of the industry, community and university professionals and students to exchange and share their experiences, new ideas and research results related to all aspects of Library Science, Humanities, Commerce, Management, Social Sciences, Business Economics and Environmental Sciences. The Subthemes of the event are:

- Library Science.
- GST.
- Open Source Software.
- Role of Teachers in Lockdown Period.
- Transportation System in India.
- Library Science Education in India.
- Local Need based Rural Development.
- Role of NAAC in India.
- Impact of COVID -19 on Exams of Universities and Colleges.
- E-commerce and International Trade.
- Business Ethics in COVID- 19 Pandemic.
- Banking System in COVID -19 Pandemic Impact.
- Gender Sensitization.
- Corona 19 Pandemic Situation in India.
- Indian Feminism.
- Online Education System in India.
- Indian Philosophers.
- Support System in Pandemic.
- Woman Empowerment and Sensitization.
- Digital Library of India.
- Role of Political Parties in COVID- 19 Pandemic.
- Financial Market in COVID- 19.
- Indian Govt. Ethics in COVID- 19 Pandemic.
- Indian History.
- Lord Buddha.
- UGC-INFILBNET.
- N – LIST.
- Challenges in Agriculture Development.
- Indian Accountancy System.
- Insurance Policy in India.
- Indian Agriculture Marketing.
- Indian Economy.
- Trends of Social Sciences in COVID-19 Pandemic.
- Public Debt and Social Welfare in COVID -19 Pandemic.
- Climate Change in the world in COVID-19 Pandemic.
- Konkan History.
- Role of Media in Pandemic Situation.
- Indian Commerce System.
- Impact of Lockdown Period on Social Life.
- Innovative Ideas in the Social Sciences.
- Impact of COVID-19 on Library Science in India.
- New Indian Education Policy.
- Food Security in COVID-19 Lockdown.
- Role of Google Classroom in Pandemic Situation.
- Impact on Recruitment in India during COVID-19 Pandemic.
- Pharmacy Medical Business in COVID-19 Pandemic.
- Impact on Private Job Sectors in India during COVID-19 Pandemic.

For further details, contact Organising Secretary, Prof. Kishor M Waghmare, Assistant Professor, Anandibai Raorane Arts, Commerce and Science College, Vaibhavwadi, Sindhudurg- 416 810 (Maharashtra), Mobile No: 7276894561, E-mail: *kmwmbp@gmail.com*. For updates, log on to: *www. anandibaivaibhav.co.in/* ❑

BOOK REVIEW

A New Light on Engineering Education

Seema Singh*

Higher Education has been given due importance in the developmental paradigm of independent India and proper attention was given for the growth of the sector. Engineering Education being a significant component got its due accordingly. However, a shift was experienced in the growth path during 1990's as a response to the drastic change in the economic environment as globalisation, use of information and communication technology in business which made easy movement of labour and capital across the borders. Market became very competitive. To sustain such competition, corporate sectors opted to enhance technological intensity of the production process. Demand for Engineering Manpower increased manifold to innovate, adapt, work and repair technological inputs. Supply side response was immediate and thus, experienced massive growth in engineering education (Singh 2013, Singh 2005). Three decades since then,is certainly a time to look back and critically examine the growth path. To do the same, Prof. Jandhyala B.G. Tilak and Dr. Pradeep Choudhury have come up with their working paper entitled, "Paradoxes and Contradictions in the Growth of Engineering Education in India: Challenges and Prospect".The paper is very exhaustive and covers a wide range of spectrum. It presents a critical, descriptive and analytical account of some of these challenges that engineering education in India faces, and its prospect using available data on engineering education and on conditions in the labour market for engineers, on the basis of a variety of alternative indicators (p. 14).

The working paper is divided in eight sections and mainly covers five main aspects: First, the trends and pattern in the growth of engineering education

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in India and the major changes it has experienced over the years are discussed particularly considering the expansion in term of number of institution and enrolments. Second, it also describes the strong role of the private sector vis-a-vis the public sector in engineering education. Since almost all the dimensions of growth in engineering education have an interface with the growing role of private sector, the role has not been discussed as a separate paper (pp. 17). The analysis focusses on examining the issues using the latest data on standard indicators such as the number of engineering institutions, enrolments, sanctioned intake, attendance, faculty size, public expenditure, household expenditure, employment and wage/ salaries for engineering graduates (pp. 17-18). The sources of data include: All India Survey of Higher Education (AISHE) reports that covers almost the entire higher education, and the analysis of Budget Expenditure on Education (ABEEE) (both published by MHRD). All India Council for Technical Education (AICTE) annual reports and on-line data on its website, and annual reports of the University Grants Commission (UGC) (pp 20).

The third section examines the changing trends and patterns of the growth of engineering education in terms of institutions and enrolment. Specifically, it discusses changes in the demand for engineering education in India during the last three decades as this period has experienced dramatic global and national events- (pp. 18-19). The paper also discusses the high rate of return as one of main reason for demand of the private engineering education (pp. 22).

After giving the over-view, next four section of the working paper (Section 4 to 7) are the real value addition to the existing literature. Inequalities in the growth in engineering education have been discussed in the Section 4, by examining locational

variations in term of number of institutions, access of weaker sections of society, gender, social (cast) and economic groups. Enrolment in engineering education by gender has marked a big increase from a meagre below one per cent in 1961-62to 30 percent in 2018-19. This rate of growth in women's enrolment in engineering education (15.7 per cent) in the last four decades is higher than the growth in their enrolment in overall higher education (8.3 per cent). However, the enrolment is still not at par with the enrolment of male students. Often, it is argued that engineering and technical education is a masculine domain and hence, out of reach for women. Those who support this line of argument points to the perseverance of certain untenable social myths like 'women are emotional, while technology is strictly logical and hence, both do not go together'. Nevertheless, the gradual improvement highlights gradual rise of interest (pp. 48-49).

There is high degree of regional imbalance also. Presently around two-thirds of India's engineering institution at the undergraduate level are located in the states of Tamil Nadu, Karnataka, Andhra Pradesh and Maharashtra even though they account for less than one-third of the total population of the country. The southern region has almost half of the total engineering institutions, whereas the eastern region has only a tiny number. According to the latest statistics available from AICTE, there are around 1447 degree level engineering institutions (44.6 per cent of the total institutions in India) in 2018-19 in the southern region, which consist of five states and one union territory namely Andhra Pradesh Karnataka, Kerala, Puducherry, Tamil Nadu and Telangana, whereas there are only 226 institutions in the four major states of the eastern region that includes Assam, Jharkhand, Odisha and West Bengal (7.2 per cent of the total institutions in India) (pp. 42). The paper also discusses the enrolment of students in the first year of engineering education by different social groups for last seven years. The participation of Scheduled caste students was merely 10.73 in 2012-13 which has marginally increased. Minorities and Scheduled Tribe students have also marginally gained. Interestingly, the enrolment of students from the forward caste groups has declined from 44.1 percent to 43.1 per cent during the same period (pp.51).Also, an attempt has been made to compare and contrast the expansion

of engineering education with the growth of other branches of technical education and other branches of higher education including social sciences in this section (pp. 19).

Section 5 looks at the quality concern of the engineering education in India. It starts with discussing the recruitment of teachers, and their qualifications, as these are significantly related to the quality of faculty which will have an impact on their teaching and research. Refering in this context to issues on regulation and accountability using National Board of Accreditation (NBA) reports and other policy documents of the AICTE and MHRD with an expectation that they may reveal relatively unknown factors if any behind the expansion of the private sector in engineering education and its impact on quality. The section also reviews some curriculum related issues that are linked with the much-debated industry-institute linkages. Also, the section looks at global university rankings and the National Institute of Ranking Framework (NIRF) data of the Ministry of MHRD that gives a comparative idea of quality of various engineering institutions in India (pp.19).

In Section 6, an attempt has been made to unravel a few important dimensions of financing engineering education by the government and households. The analysis of data on public expenditure gives us an idea on the priority given by the state to technical education, and also specifically to engineering education and how it has led to the expansion of the private sector. The National Sample Survey data gives a few important details on household expenditure – expenses on fees and other items by students in different types of institutions and course of study. These figures give an idea on the individual cost of engineering education in India. In this context, authors have also collected data on various types of fees (tuition and other fee) charged by some public and private institutions. The same has been collected from institution's websites(pp.19).

Section 7 focuses on the labour market issues related to engineering education in India and how this field of higher education is influenced by the changing nature of work, both in the national and global markets. The issue discussed include employment/ unemployment and employability of engineers, demand-supply mismatches in the labour market, out

turn of graduates, placement (employment in campus recruitment), and wages and differences by gender, type of institution and discipline of study and finally, some of the confusing signals one gets from the ever-dynamic labour markets have also been discussed (pp.19).

An attempt has been made in the concluding section to draw a few major conclusions and policy recommendations that emerge from the study(pp.19). The paper recommends for setting up an institutional structure that would develop a robust and comprehensive database. In that perspective, I would like to add that the National Technical Manpower Information System (NTMIS) with the Head office at the Institute of Applied Manpower Research was already established during Sixth Five Year Plan which was later on merged with AICTE. However, what went wrong with NTMIS has not been discussed.

The study highlights a few important policy implications. Most significant of them is about the need to effectively regulate the growth of engineering education in the country. No new college may be allowed to be started. As per the AICTE (2018) recommendation, permission may be deferred for opening of new colleges for a few years. Though the suggestions are not new as it has been given by many previously also, but certainly here it has been given on the basis of such exhaustive and detailed base.

The main issue with engineering education is managing twin challenges – Maintaining quality in engineering education vs. increasing gross enrolment ratio. When one try to achieve one, loses the other. The model of 'unaided private institution' also gives room to compromise with quality. Professor Tilak is one of the pioneers in India to work on and an authority in Engineering Education. Dr. Pradeep Choudhury, is a recent entrant in the area but has coved more milage in a brief period. Their understanding of the topic is reflected in the treatment of the subject. Even though, it is a working paper but has the size is of a book. Thirty-five figures, twenty-four tables and twenty-four tables again as an annexure covers detailed information (data) on almost all aspect of engineering education. For such milestone achievement, authors must be congratulated. I will highly recommend the paper as a 'must read' for all those who wants to understand the Indian engineering education spectrum. ❑

THESES OF THE MONTH

SCIENCE & TECHNOLOGY
A List of doctoral theses accepted by Indian Universities
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BIOLOGICAL SCIENCES

Botany

1. Aakanksha. **Biochemical characterization and micropropagation of anogeissus latifolia (Roxb. ex DC.) wall ex guill. & per.** (Dr. Narender Singh), Department of Botany, Kurukshetra University, Kurukshetra.

2. Mahabir Singh. **Micropropagation and Biochemical Characterization of Ephedra foliata Boiss. ex C.A. Mey.** (Dr. Narender Singh), Department of Botany, Kurukshetra University, Kurukshetra.

3. Naina. **Studies on floristic diversity and ethno - botanical aspects of District Hisar, Haryana. (**Dr. B. D. Vashistha), Department of Botany, Kurukshetra University, Kurukshetra.

4. Navale, Govinda. **Improved production of** epi-cedrol **and santalene by fusion protein expression: Stability study and cyclization mechanism of epi-cedrol biosynthesis**. (Dr. Mahesh S. Dhame), Faculty of Biological Sciences, Academy of Scientific and Innovative Research, Ghaziabad.

Life Sciences

1. Anupam Singh. **Cloning and characterization of novel salt responsive genes, SbRPC5 and SbCPN10 like, from** *Salicornia brachiata*. (Dr. Mangal Singh Rathore), Faculty **of** Biological Sciences, Academy of Scientific and Innovative Research, Ghaziabad.

2. Boruah, Paranjoli. **Studies on efficiency of bacterial laccase enzyme on bleaching of bamboo pulp. (**Dr. J Kalita), Faculty of Biological Sciences, Academy of Scientific and Innovative Research, Ghaziabad.

3. Choudhary, Priyadarshni. **Graphene: synthesis, characterization and its application in biomedical field.** (Dr. Sujoy K Das), Faculty of Biological Sciences, Academy of Scientific and Innovative Research, Ghaziabad.

4. Gauri. DNA **copy number variations and type 2 diabetes in Indians.** (Dr. Sridhar Sivasubhu), Faculty **of** Biological Sciences, Academy of Scientific and Innovative Research, Ghaziabad.

5. Harsiddharay, Raval Kavit. **Design and development of nano-sized formulations for oral delivery of Insulin and C-peptide.** (Dr. Manish K Chourasia), Faculty of Biological Sciences. Academy of Scientific and Innovative Research, Ghaziabad.

6. Lavi Rani. **Development of a** *Drosophila* **based model for studying diabetes mediated renal tubular dysfunction.** (Dr. D. Kar Chowdhuri), Faculty of Biological Sciences. Academy of Scientific and Innovative Research, Ghaziabad.

7. Lohith, K. **Biotherapeutic propensity of probiotic yeasts on candidiasis**. (Dr. Anu Appaiah K A), Faculty of Biological Sciences. Academy of Scientific and Innovative Research, Ghaziabad.

8. Muinao, Thingreila. **Role of cell cycle regulatory transcription factors in G1/S transition of ovarian cancer cells**. (Dr. H P Deka Boruah), Faculty of Biological Sciences. Academy of Scientific and Innovative Research, Ghaziabad.

9. Muvva, Charuvaka. **Computational studies on the structure, dynamics and binding of inhibitors with proteins involved in age-related diseases.** (Dr. V. Subramanian), Faculty of Biological Sciences. Academy of Scientific and Innovative Research, Ghaziabad.

10. Pathak, Priya. **Effect of diet induced dyslipidemia on vasoreactivity, systemic and skeletal muscle insulin sensitivity in C57BL/6 and NOS2KO mice.** (Dr. Kumaravelu Jagavelu), Faculty of Biological Sciences. Academy of Scientific and Innovative Research, Ghaziabad.

11. Reddy, Sukka Santosh. **Exploration of novel immunometabolic mechanisms regulating cardiometabolic disorders. (Dr.** Manoj K Barthwal), Faculty of Biological Sciences. Academy of Scientific and Innovative Research, Ghaziabad.

Zoology

1. Anju Rani. **Diversity of otolith and scale in freshwater fishes of family cyprinidae (Order cypriniformes) from Northern India.** (Dr. Deepak Rai), Department of Zoology, Kurukshetra University, Kurukshetra.

EARTH SYSTEM SCIENCES

Geology

1. Sharma, Vikram. **Active Tectonic Studies of the Frontal Himalayan Terrain, Kathua District (Jammu and Kashmir), India.** (Dr. A. R. Chaudhri), Department of Geology, Kurukshetra University, Kurukshetra.

2. Yoginder Singh**. Active tectonic studies in the Himalayan foothill region between Beas and Chakki Rivers,**

Western Himalaya, India. (Dr. A. R. Chaudhri), Department of Geology, Kurukshetra University, Kurukshetra.

ENGINEERING SCIENCES

Chemical Engineering

1. Jadhav, P M. **Reactor design and process intensification of energetic materials**. (Dr. Amol Kulkarni), Faculty of Engineering Sciences, Academy of Scientific and Innovative Research, Ghaziabad.

Computer Science & Engineering

1. Monika **Efficient resource allocation & scheduling approaches in cloud computing**. (Dr. Pardeep Kumar and Dr. Sanjay Tyagi), Department of Computer Science, Kurukshetra University, Kurukshetra.

2. Garg, Matish. **Multi-objective based task scheduling techniques for improving performance and data security in mobile cloud computing. (**Dr. Rajender Nath), Department of Computer Science, Kurukshetra University, Kurukshetra.

Electrical & Electronics Engineering

1. Pattanaik, Priya Ranjan. **Novel algorithms for distance relay protecting transmission line.** (Prof. Smaran Kumar Sanyal), Department of Electrical Engineering, Siksha O Anusandhan University, Bhubaneswar.

Electronics & Communication Engineering

1. Das, Anuja. **Timing synchronization schemes for OFDM based wireless systems.** (Prof. Benudhar Sahu), Department of Electronics and Communication Engineering, Siksha O Anusandhan University, Bhubaneswar.

2. Nath, Badugu Prudhvi. **Design and Development of RF-MEMS based reconfigurable antenna for body area network applications**. (Dr. M Siva Kumar and Dr. B T P Madhav), Department of Electronics and Communication Engineering, Koneru Lakshmaiah Education Foundation, Guntur.

3. Paramata, Rama Krishna. **Design of low power reconfigurable data converter for biomedical applications.** (Dr. K Hari Kishore), Department of Electronics and Communication Engineering, Koneru Lakshmaiah Education Foundation, Guntur.

4. Singh, Arun Kumar. **Characterization of polar region ionosphere for effective communication and navigation applications.** (Dr. Rupesh M. Das), Faculty of Engineering Sciences, Academy of Scientific and Innovative Research, Ghaziabad.

Mechanical Engineering

1. Dumka, Pankaj. **Desalination of water using modified form of the single slope solar still and double slope long still.** (Dr. Dhananjay R Mishra), Department of Mechanical Engineering, Jaypee University of Information Technology, Guna.

2. Pathak, Saurabh. **Optimization of magneto-viscoelasticity of magnetic fluids and development of its applications in thermal and mechanical systems.** (Dr. Rajendra Prasad Pant), Faculty of Engineering Sciences, Academy of Scientific and Innovative Research, Ghaziabad.

MATHEMATICAL SCIENCES

Mathematics

1. Abhishek Kumar. **Mathematical modelling and development of decision support system.** (Dr. Naresh Kumar), Faculty of Mathematical & Information Sciences, Academy of Scientific and Innovative Research, Ghaziabad.

2. Adilakshmi, Gorantla. **Some fixed point results and applications in bipolar, modular, C*-algebra valued fuzzy soft and complex valued dislocated quasi b_metric spaces.** (Dr. G N V Kishore), Department of Mathematics, Koneru Lakshmaiah Education Foundation, Guntur.

3. Kambampati, Gowthami. **Convective flow between rotating stretchable disk in an orthotropic porous media.** (Dr P Hari Prasad), Department of Mathematics, Koneru Lakshmaiah Education Foundation, Guntur.

4. Kanaujia, Anurag. **Innovation, regulation and governance: Study of Genetically Modified (GM) crops in India.** (Dr. Sujit Bhattacharya), Faculty of Mathematical & Information Sciences, Academy of Scientific and Innovative Research, Ghaziabad.

PHYSICAL SCIENCES

Chemistry

1. Bangalore, Pavan Kumar. **Semi-synthetic derivatives of usnic acid as potential antimicrobial agents.** (Dr. K. Srinivas), Faculty of Chemical Sciences, Academy of Scientific and Innovative Research, Ghaziabad.

2. Chawla, Sneha. **Study towards re-usability of dye contaminated water by functionalized adsorbents.** (Dr. Nahar Singh), Faculty **of** Chemical Sciences, Academy of Scientific and Innovative Research, Ghaziabad.

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5. Dasari, Srinivasa Rao. **Design, synthesis and in vitro studies of some novel hetrocyclic compounds as potent biological agents.** (Dr. Seelam Naresh Varma and Dr. Tondepu Subbaiah), Department of Chemistry, Koneru Lakshmaiah Education Foundation, Guntur.

6. Jagtap, Rahul. **Base metal-catalyzed C–H bond functionalization of (Hetero) arenes: Scope and mechanistic perspective**. (Dr. Benudhar Punji), Faculty of Chemical Sciences, Academy of Scientific and Innovative Research, Ghaziabad.

7. Mala, Ramanjaneyulu. **Design, synthesis and applications of novel imidazo [1,2-a] pyridine based sensors for detection of contaminant metal ions in the environment. (Dr.** S Thennarasu), Faculty of Chemical Sciences, Academy of Scientific and Innovative Research, Ghaziabad.

8. Manda, Rajesh. **Alkyne as a platform for c-metal bond generation and studies on its tandem utilization. (Dr.** M. Sridhar Reddy), Faculty of Chemical Sciences, Academy of Scientific and Innovative Research, Ghaziabad.

9. Narender Singh. **Compressibility, viscosity and conductance studies of solvation behaviour of some alkali metal salts in binary mixtures of organic solvents at 298.15 K.** (Dr. Hardeep Anand), Department of Chemistry, Kurukshetra University, Kurukshetra.

10. Pavankumar, P. **Multi platform mass spectrometry based metabolomic studies on plasma metabolites of hemodialysis patients, lipids of milk, fatty acids of rice, and characterization of *N*-methyl amino acids.** (Dr. S. Prabhakar), Faculty of Chemical Sciences, Academy of Scientific and Innovative Research, Ghaziabad.

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Physics

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