

Vocational Education and Skill Development in Higher Education: A Systems Approach

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Abstract

Changing market and industrial demands present a need before the higher education sector to re-define and align themselves to the needs of the market. For India creating this framework becomes very challenging due to rich diversity in culture, folk skills and traditional practices, which affects the way people associate with environment and surroundings, the way they think and the way they lead life. Therefore, it becomes important that while implementing the interventions for the required integration of skilling and vocation cultural and values-based aspects of a community or a region are not compromised. This chapter presents as a case study the skilling model of the Dayalbagh Educational Institute practiced for more than nine decades and scaled up to different regions of the country. This model seamlessly blends skilling with the conventional education from pre-nursery years onwards.

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11. Why not every skill learner becomes an entrepreneur?

1 Introduction

The change in the structure of employment and value addition occurred during a period that also saw a parallel enhancement in higher-order cognitive and non-cognitive skills of the labor force. The rapid advancement of information technology and its cascade like IOT, AI and Robotics and globalization has led to major structural changes in the global economy and reorganization of multi-skill trained manpower. There are major requirements from the viewpoint of skilling for employability and emotional stability i.e. skills needed to support basic needs of life through hands on experience, real life practice, and learning tools to economize earnings and time both. Further, skills are needed to continuously support and sustain existing employment and progressions by updating skills expected by employers from its employees. It is also crucial to understand the social dimension of skilling where skilling gets acquired through family trades and practices, which can be upgraded and utilized as tools, developed time to time, so that one does not loose in competition.

Skills can be acquired through broadly speaking two models i.e. embedded and appended. The government India is encouraging both models in existing Institutes. It is not out of place to mention that students have been using second model for long time by acquiring skills beyond their college/ university timing to learn and practice skills so their employability opportunities gets enhanced , therefore indicating that existing model of educations needs changes to create opportunities for existing students to learn and practices as part of their education so that overall budget of each students remains in control and benefit of the skill programs can be extended practically all students. However, better ties with industries and laboratories with educational institutes at all levels can create socio-economic system which would be most suitable for skilling human power and deliver benefits expected through skills for nation building.

Skill can further be divided into skill for assistance that means basically repairs and modifications for existing entities. Skill required for creating novel entities and its support and services, elite skills where, presently manpower available is diminishing and would not be available after few years or a decade and the skilling required for extremely specialized training on highly expensive equipment, infrastructure, and services.

Demographic dividend that India can harness as the youngest nation of the world can be a valuable enterprise for the country, provided these ready-to-recruit cohort is trained on skills that could sustain them through the turbulent global changes that markets, and industries are witnessing today. This dividend in India is spread across diverse culture, social systems and practices and geography. This multiplexed diversity makes it very challenging to create any standardized program in skilling and vocation catering to the needs of different regions. This diversity presents a unique

opportunity to create unique programs with close social engagements, which are sustainable, culturally oriented and are tailored to the needs of a geographic region. Global frameworks for skilling have two categories of skilling first the core and common skills mandatory for every prospective and in-job human resource and the second are the domain specific or vocation specific skills. The former skills are basic language and communication skills, numeracy skills, basic IT skills, critical thinking, adaptability. The changing global trends across the globe has forced to adapt and learn the core skills for sustenance. In India, schemes like Digital India, Make in India, Swachh Bharat and Women empowerment are national initiatives to orient the general masses of the country to adapt and sustain the sweeping wave of industrial revolution 4.0. This chapter tries to address some fundamental question like how a country like India, which is culturally diverse will be able to sustain its cultural identity while remaining progressive? How can we create culturally rooted techno-oriented adaptable future human resource who are tethered to moral, ethical and spiritual values of our own culture of scholarship going back to Gurukul, and institutions like Nalanda and Taxila?

This chapter presents as a case study, the skilling model of the Dayalbagh Educational Institute (DEI) which, the institute has implemented across the country in different cultural and geographic regions.

2. History of Skilling at DEI

The skilling framework of DEI is an example of the outcome of a beautiful synergetic relationship between a community and academia, which began in 1915 when group of householders, who were the seekers of ultimate truth of life, decided to have a settlement away from the din and noise of city of Agra. This community was founded on 20th January 1915 and was known as Dayalbagh, on the very next day foundation for a co-educational middle school was laid and this was the beginning of education of DEI. On 1st January 1917 this co-educational middle school started as Radhasoami Educational Institute with 78 students on roll. Dayalbagh also started agricultural farming of crops, vegetable and fruits, where every member of the community along with the young learners participated and were informally trained on basic skills like sharing resources and soiling hands and most importantly self-reliance. In April 1917, small scale manufacturing industries were started to generate employment and income for the needs of the community. In a small room in the school building manufacturing of leather buttons started and the students also started participating in this trade. These community-based practices started nurturing the personality of the student and also the framework of education. Slowly this small-scale production expanded and by 1928 the community started manufacturing fountain pens, sound boxes for phonographs, ceiling fans, cutleries, biological instruments, chemical balances and electric clocks. This expansion led to an Industrial Park, which was called Model Industry. Continued participation of students from REI which had evolved into a Higher Secondary school, gave opportunity for apprenticeship.

In 1927 the progress and expansion of model industry inspired the foundation of a Technical College giving Diploma in Mechanical, Electrical and Automobile Engineering. This was the point when formal vocational education started in DEI.

In 1947, Women's Training College started which was affiliated to Agra University. This college started Bachelor in Arts and Education. In 1950, Engineering College for Boys was started. All these students were oriented towards Indian Culture, Comparative Study of all the religions along with participation in the best practices of the community like Agricultural Operation, Industrial practices, rural development etc.

In 1975, Education Policy of DEI was framed, and the three colleges were merged under one umbrella called the Dayalbagh Educational Institute. The life skills that students learnt through community interaction were made the compulsory core courses primarily orienting students towards society, understanding the subtle aspects of life and to develop into a balanced and complete personality. These core courses were:

- i. Cultural Education
- ii. Comparative Study of Religion
- iii. Agricultural Operations/Rural Development
- iv. Co-Curricular Activities
- v. General Knowledge and Current Affairs
- vi. Sports & Games

Above core courses emphasize on experiential learning through social engagements of various types. Apart from the above core courses, students in the first year also take work-based experience courses, with an objective to orient the students of conventional degree programmes towards skills and vocational training. These courses are designed around a discipline to train students on the hands-on skills in their own subject areas.

In 1981, DEI was granted the Deemed to be University status. Today DEI is an integration of education from pre-school to D.Sc/D.Litt levels. Every activity sphere in DEI adheres to Total Quality Management framework (TQM) with Initiative, Innovation, Quality and excellence as the key parameters.

Education at DEI is an outcome of the interaction of 6 educational pillars:

1. School education
2. Vocational Education
3. Technical Education
4. Open Education
5. University Education
6. Entrepreneurial Education

In DEI, the above six systems, despite being distinct are well knit with interactions that have led to new opportunities and horizons and have provided mobility to the learners to move from one system to the other through multiple entry and exit, thus giving them an opportunity to widen their experiential and scholarly knowledge with a holistic approach to problem solving. Since no system is absolute, therefore, evolution through innovation would take place in time and space, both. The continuous changes are accepted in the DEI system through DEI Quantum Jugaad approach so that economy, flexibility and freedom built in the system can be fully exploited to benefit the stakeholders. This approach leads to higher order efficiencies playing their role to minimize resources and financial needs.

This approach of DEI completely conforms to the philosophy of Unifying Knowledge and Mobility and Return to the “Renaissance Man” by Jay W. Forrester (MIT). He was of the view that a person with understanding of the systems tries to see common elements in diverse settings and therefore creating transferability between diverse structure. He strongly believed that due to systems approach in education, the underlying unity between fields becomes teachable, he further advocated the concept of the “Renaissance Man,” who has broad intellectual interests and is accomplished in areas of both the arts and the sciences.

3. Levels of Integrated Skilling in DEI

Educational framework in DEI focuses on evolutionary development of skills. Therefore, at DEI for every age and stage appropriate skilling activities are custom designed to inculcate systems and design thinking.

3.1 Pre-nursery stage

Young toddlers up to the age of three years in the pre-nursery stage participate in the agricultural operations with their parents. At this stage learning is based on observation. Outcomes of learning are working in team, sharing ideas, resources and space and the spirit of brotherhood.

3.2 Nursery to Primary Years: Children Recreation Centers

Students from the age of three are engaged into well-defined activities which are fun and purposeful. These activities groom, motor skills, logical and analytical skills. Students are also engaged in activities like cleaning their immediate neighborhood on every Sunday under the supervision of their teachers. This makes them responsible and accountable to their society and also gives them opportunity to experience nature. In the primary years interested learners can also attend community owned School of Arts & Culture, which educates children on Indian Culture through performing folk-arts and practicing folk skills. Outcomes and attributes of the above two stages are shown in the adjacent figure.



Figure-1: Attributes and outcomes of Skilling upto Primary Level in DEI

3.3 Tinkering Labs: तोंड-मोड-जोड for Class VI to Class XII

This stage is the discovery stage, where young learners are left to discover their own potentials and passions through well-structured tinkering activities. Discovery Labs are the vibrant space stocked with facilities for various skills. At class-VI students are in

the discovery mode, where they discover their own talents. From class VII onwards students are made to pursue their talents with their own inspiration through well-structured tinkering activities.

After class VIII students who have an aptitude for skilling can exit into purely skill based pathway. The Girls and Boys Higher Secondary Schools of DEI have been granted Atal Tinkering Labs. The complete pathway for skilling at DEI with options for multiple entry and multiple exit is shown in Figure-1

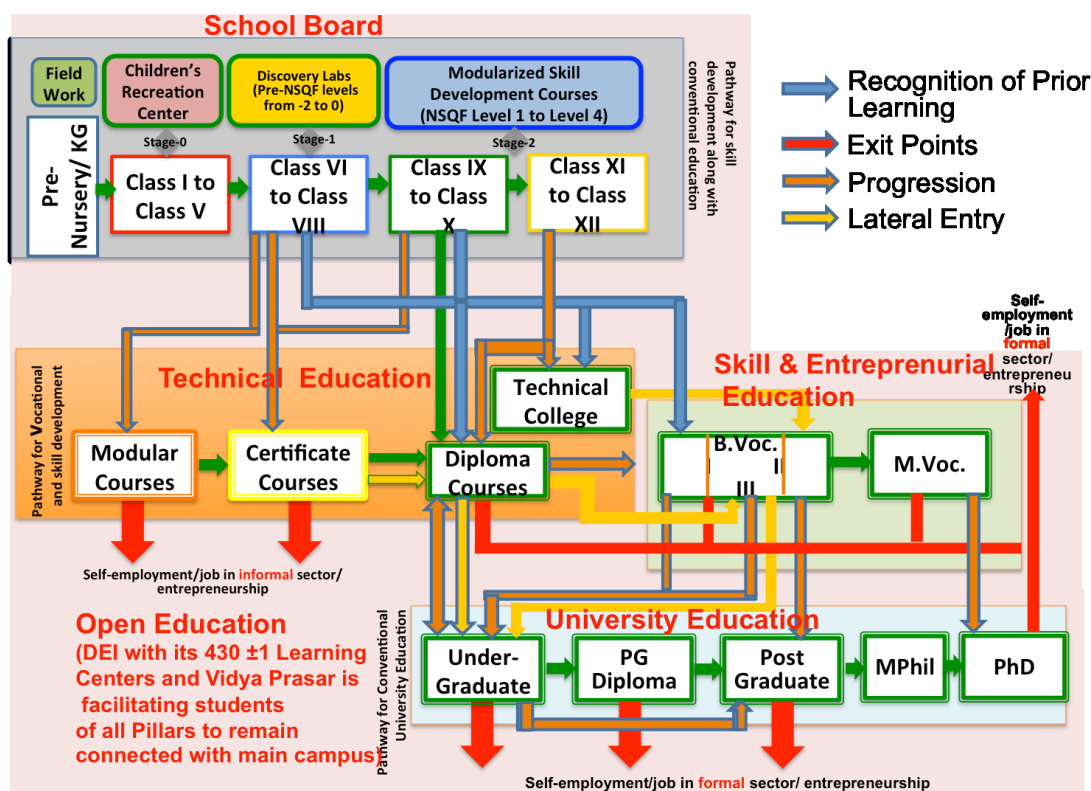


Figure-2 Pathways for transition at different levels

4. Vocation in Higher Education

The government has taken a bold and aggressive initiative to create alternative pathways for skilling through the DDU Kaushal Vikas Kendra (DDUKVK), an organization established under the scheme of UGC, Government of India, offer B. Voc., M.Voc. and Ph.D. programmes. DDUKVK shall also be responsible to offer the skill development / Work Experience courses at UG and PG level. The staff involved in providing skill training at UG/ PG level shall be deemed to be the part of the DDUKVK. The skill training of NSQF level 5 and above as defined by National Skill Development Council (NSDC), Ministry of Skill Development & Entrepreneurship shall be covered by the DDUKVK. The B.Voc. Programme in the following streams are offered in DEI:

1. Automobile
2. Agricultural Technology
3. Apparel Design
4. Food Processing & Preservation
5. Dairy Technology
6. Textile
7. Renewable Energy

8. Internet of things
9. Water, Sanitation & Waste Management
10. AI & Robotics
11. IoT
12. Telecommunications
13. Ceramic & Pottery
14. Tourism and Hospitality
15. Green House Technology
16. Banking & Taxation
17. Telematics
18. Agriculture technology
19. Accountancy & Law
20. Digital Manufacturing
21. Recycled Craft

The M.Voc. programmes in the following streams are also offered-

1. Apparel Design
2. Food Processing
3. Textile
4. Dairy Technology
5. Automobile
6. Renewable Energy

The above B.Voc. and M. Voc. Programmes have been recognized by UGC.

Above programmes cut across humanities, sciences, technology and management. Curriculum for the first two semester of all the 21 B. Voc programmes is same, where students are trained on essential core skills like:

- Language
- Basic Mathematics
- IT
- Accountancy and taxation
- Web development
- Appreciation of Arts (Architecture/Music/Drawing & Painting)
- Entrepreneurship
- Team projects

Above courses give students a basic platform to understand various disciplines and flexibility to take informed decision. Students of B.Voc are also given freedom to change their choices after two semester and opt for a more suitable stream.

5. Maintenance Network & Living Labs of B.Voc. Programmes

Most of the B. Voc programmes give practical training through a concept called Lab on land. For example, the institute has 1 MW solar power plant, which acts as a living lab for the students of renewable energy and institute trains students on installation and maintenance. B. Voc Programme in Dairy Technology is collaborating with a community owned dairy farm having 1200 milking cattle, which acts as a living lab and in the maintenance of the Dairy Farm. A mini Dairy Plant has been setup to process

the milk from the Dairy farm, the milk products are sold in the campus by the students. Students are also given training on export of milk products.

B. Voc Programme on food processing runs on-campus canteen. All these curriculum integrated trade specific hands-on practices are like virtual incubation, giving opportunity to students to understand the nuances of entrepreneurship and start-ups while making the risk irrelevant. Above are a few examples, at DEI, almost all the B.Voc programmes are associated with a living lab.

6. Blending Vocational Programmes in Higher Education through Transition Pathways

General reluctance and skepticism in accepting the vocational degree programmes by the custodians of conventional education is due to the dilemma on how to integrate and blend this disruption in to the well-defined educational structure of general education. DEI has created transition pathways which integrate vocational programmes with conventional education. The entire framework of vocational education is designed in a way to give freedom and time to take informed decision on their choices. These transition pathways provide mobility to students to gradually progress. The transition pathways in DEI can be broadly categorized as follow:

i. Intra Vocational transition clusters

Students admitted to the vocational degree programmes are divided into two clusters i) Non-Science Cluster and ii) Science Cluster. The Science cluster is further differentiated as students with mathematics background in class XII and students with non-mathematics background.

Students of science cluster have the transition pathways to non-science cluster. But for transition from non-mathematics to mathematics based group requires students to take up bridge courses which are evaluated.

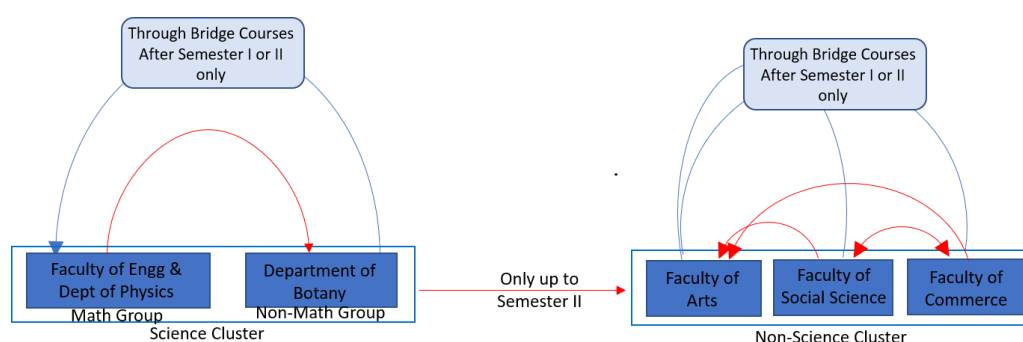


Figure-3: Intra-Vocational Transition Pathways

Students of non-science cluster can transit to any B.Voc programme of non-science cluster after two semesters. Intra-vocational transition pathways are shown in figure-3.

ii. Vocational to Conventional education transition

Institute also offers pathways to the B.Voc students pursuing B.Voc programmes from the Department of Physics & computer Science and Faculty of Engineering to exit to B.Tech. programme. These students are offered bridge courses required to patch the learning gaps. Students from other streams are given opportunity to exit to other appropriate conventional degree programme.

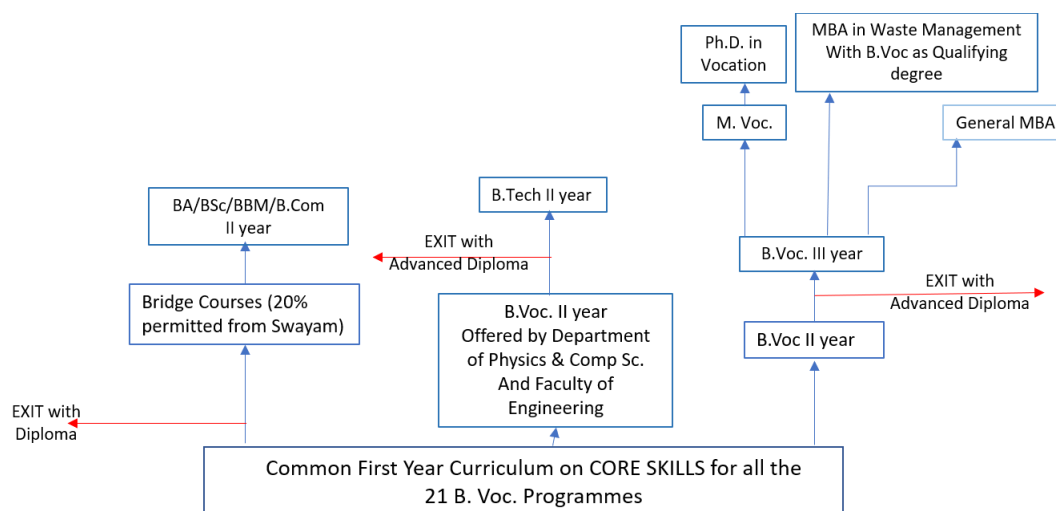


Figure-4: Transition Pathways in DEI from B.Voc. to Conventional degree programmes

DEI offers a specialized MBA programme in Waste Management for only B.Voc. degree holders to facilitate progression pathways.

7. Skilling and Vocational Education with Quality & Values: Sigma 6 Q-V

Highly diverse demand driven market place poses some challenges before the academia on what to skill and how to skill? To address this challenge DEI has created a **Sigma 6 Q-V framework**, DEI own the trademark of this framework. This broadly identifies essential aspects of life which require development and innovation for better quality of life of all the stakeholders of the society. These areas are:

- I. Air & Water
- II. Healthcare
- III. Renewable Energy
- IV. Education
- V. Agri & Dairy
- VI. Women Empowerment



Figure-5:Sigma 6 Q-V

Quality and ethical, moral & spiritual values are the bottom line of all the initiatives. Today's data and machine-driven social culture has endangered the basic values from individuals. Without realizing the decision-making capability of the entire humanity is slowly diminishing due to increased reliance on intelligent machines. Addressing the grave challenges of cybernetics Prof. V. Rajaraman emphasized on the warning given by Norbert Wiener in 1950. He predicted the existence of the automatic factory, argued

that electronic computers were thinking machines capable of taking over many human decision-making processes, and cautioned that humans must not let machines become their masters. Today, understanding the confluence of cybernetics with liberal humanism has become important to predict the future of mankind. A big question looms before the world when manmade machine becomes conscious will they have autonomous thinking and resultant morals, or will the designers unconsciously build into Cyborgs their own moral values...? And who we will turn to for proper answers? Answering these dilemmas Prof. Rajaraman says that commonsense knowledge, religious beliefs, and consciousness will be the drivers of humanism. This necessity establishes quality, moral, ethical and spiritual values as the most important factors in all the future development. Therefore, at DEI training on meta-dimension is given to inculcate higher order thought process, adaptability and intuitive thinking.

8. On-Campus enterprises: Opportunity to innovate, incubate and earn

8.1 Quantum Jugaad

With the beginning of vocational degree programs skilling initiatives have taken a different dimension. With a new objective of grooming future innovators and creative leaders, now DEI has created the right ecosystem to make the students job enablers. DEI has also created common platform called 'Quantum Jugaad' to encourage students to bring out their creative acumen and come with innovative marketable ideas and test those ideas inside campus. These ideas if found viable, are incubated further with the help of mentors.

8.2 Student run enterprise

Outcome of practical skilling in almost all the B.Voc programmes are marketed in the campus. This gives students instant evaluation of their product and projection of market response. The B.Voc. Dairy Technology students run a mini dairy processing plant, this plant is HACCP and FSSAI certified. Students process about 500 litre of milk into milk products which are sold to the students in the campus. Flavoured milk is also exported on regular intervals to expose students to the export import licensing.

Students of Food Processing run a food kiosk and manage the entire chain from procurement to marketing. Here students are given freedom to experiment their ideas, scale it up and market it to their own peers in the food kiosk of the Institute. Students of Apparel design stitch uniforms for the students.

8.3 Earn while Learn

Internationally students are given opportunities to work on campus at various levels depending upon the background of students. Slowly students can develop expertise and grow in part time jobs on campus along with their studies. Therefore, twin objectives are achieved i.e. continuous growth in educational opportunities as well as experience in jobs at various levels, developing human skills in addition to professional skills. Therefore, students can be given opportunities in Living Labs of the institute like solar power plants, Dairy Plant, Surveillance Network, optical fiber network, WiFi network, waste disposal, library, computer centre, and security as few examples.

These systems give opportunity to students of different B.Voc. programmes to engage in the product development, product preparation, maintenance and marketing of the products for their own colleagues and even export these products, and earn their tuition fee or credit points which can be utilized for all activities related with profession and personality development. Such schemes have benefitted students with no-means. Students can spend two to four hours per day depending upon the interest and need. However, basic requirement suggested that they should be able to earn tuition and hostel support for themselves. It becomes obligatory on the institute that such enablement should not attract them towards full time jobs, therefore, maximum time can be decided by the counselors based on economic background and level academic performance. All programs are designed in way that student have to register for minimum number of credits to ensure their continuity in the university.

8.4 Education through skilling for students without means

Generally large number of students in the universities and in skilling programs are under privileged, economically weaker, and girl population. It becomes mandatory to support students financially or in kind so that they can achieve higher goals without further financial burden and exploitation by society. For example, this Institute has more than 80% students belonging economically weaker section and about 70% girl population. Mechanism must be set up in place in the Institute that students without worrying about their social and financial status should be able to earn education and social status of their free will. The Institute has been developing schemes so that student under such category be able to earn enough to support their siblings and themselves. Therefore, these students can be involved directly in production of products and share percentage of total output while the production should run at not for profit.

9.Social Engagements for the development of rural and marginalized sections

DEI has 430±1 project sites across the country for engaging least, lost and last in Skilling and vocational training experience and knowledge through our students studying in B.VOC. Such students not only contribute in demonstrating business model and hand holding especially the village women to develop nano enterprises leading to export of some these products. Further self-help groups can be developed to make villagers independent small business organizations. These have produced results to promote education among next generation and understand vocational education and make better use of nano enterprise models. This leads to even honing local unique products and services. Experience of DEI in skill development and vocational education has been extended to different regions of the country in partnership with the Skill development mission of Madhya Pradesh, Maharashtra, Rajasthan.

Skilling and vocational training experience and knowledge of DEI has been extended to different regions of the country in partnership with the Skill development mission of Madhya Pradesh, Maharashtra, Rajasthan.

9.1 Mobilization of human resource through educational interventions

Universities can play a pivotal role in influencing the society around them through

mutually beneficial learning engagements. This will inspire the future human resource and will also give opportunity to the marginalized sections to transform intellectually.

At DEI such educational interventions are of two types formal and informal. In formal interventions identify the culture, folk skills and geography of a region and works closely with the natives to create customized workshops around the necessity of the existing trades. These workshops acts as incubators for mentoring, further training and establishing cooperative micro-enterprises.

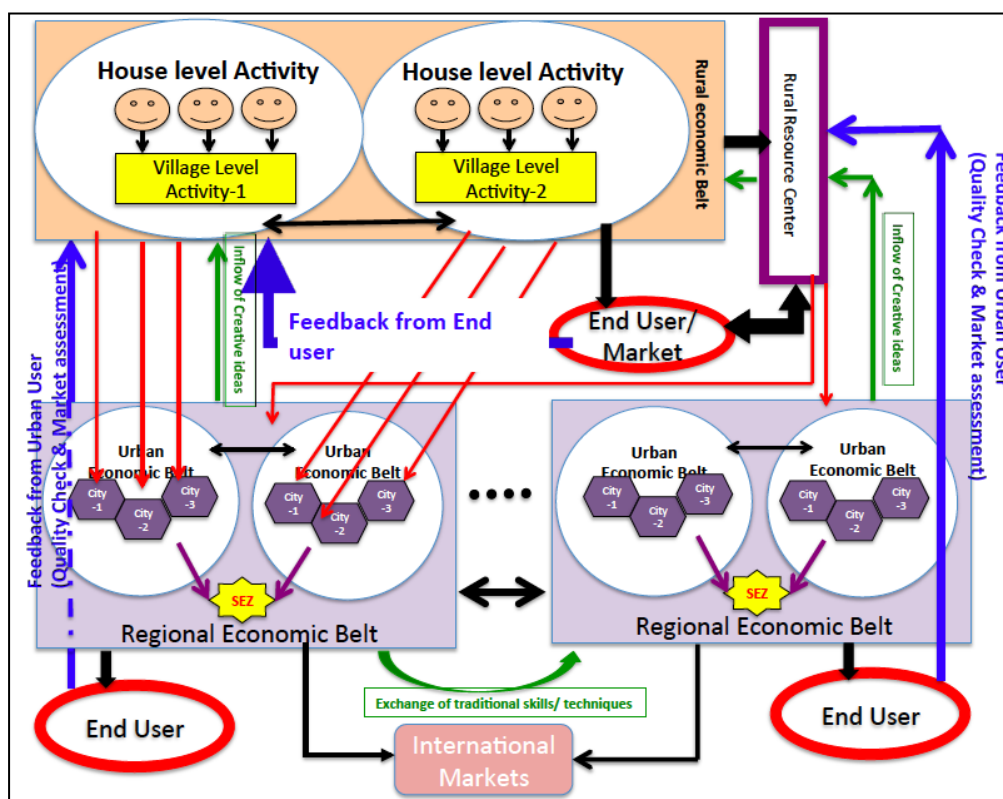


Figure-6: Framework of DEI to connect Rural Economic Zones to Urban & International Market

In a tribal cluster of Harda District in Madhya Pradesh, DEI has created three such incubators:

ATMA (Apparel & Toy Manufacturing Association): Training women folk on apparel design, value addition and product development from the native folk-skill and toy making. This workshop has helped many women to come out of MANREGA and earn upto Rs 5000 per month.

ADyNaM (Agri-Dairy Nano Processing of Multiproducts) Food: This workshop trains men and women to process the raw agricultural produce and pasteurization of milk. DEI has setup a small Dairy processing unit in the above mentioned Tribal region along with a level-1 Quality Assurance Laboratory. The women folk have learnt to make products by using the facility in the workshop at minimal rental and have started to market in the local village fairs and nearby cities.

AAM (Automotive And Multiskill) Karkhana: This workshop is equipped for training the youth on the repair and maintenance of two wheelars, tractors, farm equipment etc. Two wheeler workshop has been setup with YAMAHA motors, which has generated employment opportunities for the youth.

Above workshop provide mentored training and many real-time research projects in the area of social science, humanities have spin-out of these activities.

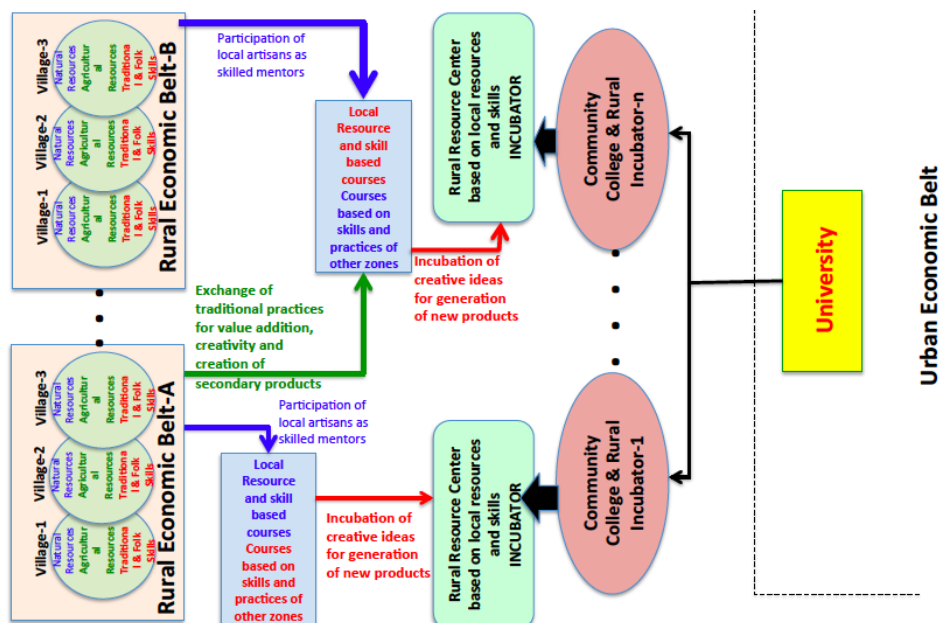


Figure-7: Concept of Educational Intervention in the rural and tribal areas

9.2 Self help group

Skilling interventions and opportunity for life long learning has brought the rural women to the forefront and Self-Help Group was created with the assistance of the mentors of DEI in the Harda District of Madhya Pradesh. The maximum monthly earning of the well skilled women is Rs 8000/-.



Figure-7: Self-help-group created by the mentors of DEI in a Tribal cluster of Madhya Pradesh

9.3 MOOCSKENE BHARAT- मुस्काने भारत

(Massive Online Open Courses on Skill & Entrepreneurship Network)

With the regional stakeholders DEI has created online content for vocational certificate programs in regional languages. This initiative is helping local mentors and learners with accelerated learning in their own regional language with content being delivered at different regional locations. DEI has 430 such project centers which act as incubators and self learning centers in the rural areas. This online skilling network is a super-space, which can become a remote brainstorming space for the artisans, practitioners of folk-skills, researchers and industry.

In a culturally diverse country like India, content generation in regional language becomes very important. Mostly the online content developed are by faculty members of elite universities mostly in English, without any use for the people who require it the most.

The content developed by DEI are in regional language keeping in view the the endpoint users. This has helped many and this model has also been adopted by Government of Maharashtra along with HP and Microsoft. In this effort DEI is the content provider.

In Madhya Pradesh DEI has created special programmes around pre and post-harvest of Bamboo, which is specific to this region.

9.4 Walk-in Medical Camps

Under informal interventions, DEI organizes weekly tinkering and training camps in the rural communities around the universities. In these training camps rural people are counseled on the scientific methods of agriculture and animal husbandry, few faculty members from the Department of Sanskrit do moral counseling based on the tenets of Bhagwad Gita.

For young learners in the age group from 3 years to 15 years, tinkering activities are organized. These tinkering initiatives are the pilot test bed for addressing certain disruptive questions that the institutions of higher learning can face in future:

- Why should students be working in same-age classes, rather than in mixed age-groups?
- Why should a student be forced to repeat a year – and waste time and motivation - if only some subjects are weak?
- Why should pupils and students follow standard programmes when neither they, nor the job positions they are going to fill, are standard?
- Why can't learning be project driven, allowing student to chalk out his/her own learning journey.



Visual Arts Corner



ACTIVITIES

- Drawing & Coloring
- Clay work
- Art and Craft work
- Pottery and Ceramics: Making & Designing of Pots

OBSERVATION CRITERIA

- Creativity
- Colour Combination
- Neatness
- Co-ordination
- Dexterity

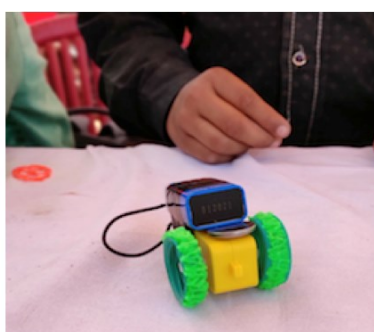


Figure-8: Weekly Tinking Camp

The unstructured project-based learning through tinkering is facilitating in bringing out very creative and jugaad acumen of the young learners. It is evident that right exposure, encouragement and facilities can mobilize the tremendous functional genius in the marginalized sections, which is yet untapped and can become potential contributor in building creative economy. Few outcomes of the tinkering activities are shown in the figure below.



Fixing wires to
battery terminals
with small magnets



Increasing wheel
diameter with a 3-D
pen



Still not satisfied....
Custom designing
wheels with a 3D pen

Figure-9: Instantaneous 'Jugaad' innovations by young learners at the rural tinkering camp

Outcomes of these informal interventions is not only inspiring the future human capital, but also gives a platform for the educators to test certain hypothesis to make policy which is not a cut & paste from the western initiatives, but is based on the needs of our very own society.

But, there is an urgent need to formally associate industries in the skill integration initiatives, which is yet to be seen in India. Further, appreciation for skilling and vocation cannot be inculcated at post secondary level. The school education should also have component of skilling right from the beginning.

10. The Indian Context: Challenges and Recommendations

India is one of the youngest nations in the world with more than 62% of its population in the working age group (15-59 years), and more than 54% of its total population below 25 years of age. During the next 20 years the labour force in the industrialized world is expected to decline by 4%, while in India it will increase by 32%.

It is estimated that only 4.69% of the total workforce in India has undergone formal skill training as compared to 68% in UK, 75% in Germany, 52% in USA, 80% in Japan and 96% in South Korea. On demand side, a skill gap study has been conducted by NSDC over 2010-2014, which indicates that there is an additional net incremental requirement of 109.73 million skilled manpower by 2022 in twenty four key sectors.

Skill development programmes of the Central Government over the years have been spread across more than twenty Ministries/Departments without any robust coordination and monitoring mechanism to ensure convergence.

Observing this, the Government of India created a separate ministry in the year 2013 as Ministry of Skills Development and Entrepreneurship (MSDE). The vision of Honourable Prime Minister of India is to make India Skill capital of the world. National Skill Development and Entrepreneurship Policy 2015 formulated by the MSDE attempts to address these concerns. It tries to bring the world of education and training closer to the world of work so as to enable them together build a Strong India. National Skills Qualification Framework (NSQF) skilling and education outcomes with the competency based NSQF levels maintains the standards and quality of manpower according to the needs of the industry ready to take up a job role. These efforts build on the legacy vocational training infrastructure of Industrial Training Institutes and Polytechnics which have now grown in number to approximately 12,000 and 3,200 respectively.

The Indian capacity for harnessing entrepreneurship has not been fully realized the MSME (micro, small and medium enterprises) sector contributes to only 17% of GDP as compared to 85% in Taiwan, 60% in China and 50% in Singapore.

The Union Cabinet had launched India's largest Skill Certification Scheme, Pradhan Mantri Kaushal Vikas Yojana (PMKVY), on 15 July, 2015, on the occasion of World Youth Skills Day by Honourable Prime Minister, Shri Narendra Modi. PMKVY is implemented by National Skills Development Corporation (NSDC) under the guidance of the Ministry of Skill Development and Entrepreneurship (MSDE). With a vision of a Skilled India, MSDE aims to skill India on a large scale with speed and high standards. Owing to the its successful first year of implementation, the Union Cabinet has approved the Scheme for another four years (2016-2020) to impart skilling to 10 million youth of the country.

Broad proposed objectives of skilling and vocational education are:

- To integrate creative cultural skilling with the national educational framework from the school level.
- To treat skill based vocational learning at par with the conventional education and to give incentives to students for outperforming in skill-based courses along with their regular courses.

- To create vocational training, production and incubation center that aims to develop capacities for original ideas, action and avenues for employment for rural learners at any age and serve as an enabling platform for reviving the rural economies and connecting them to the national /international economy.
- To create special training programs linked with employment for women to empower, enrich and skill/educate them.
- Conserving the traditional folk skills and heritage through customized skill-based education that aims at enhancing the traditional skills practiced in a rural cluster.
- Identifying the incremental innovations happening in various rural activities. Adding technological inputs to the innovation to increase the productivity.
- To lay a pilot Educational framework that allows learners to engage with the social environment positively by identifying their own talents and build self-esteem and thereby contribute to the national capacity building.

10.1 Recommendations

It is proposed that appropriate skilling models as detailed below can be introduced to bridge the dichotomy between vocational and general education. For vocational programmes, industry should also participate in content creation. Development of the country largely relies on how the rural manpower is taped.

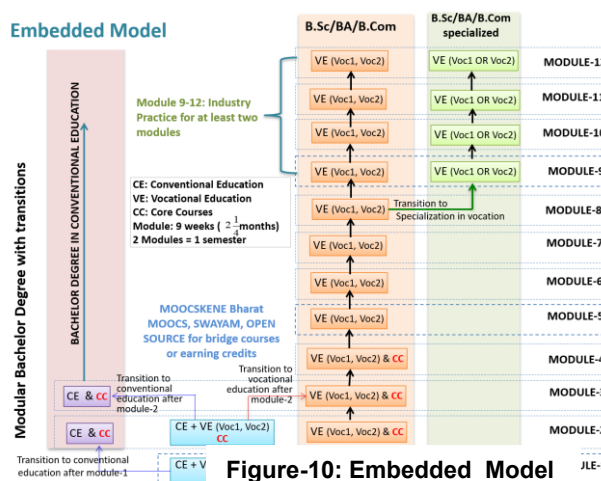
10.1.1 Proposed Skill Development Models

There are five Models of vocationalisation of UG Programmes:

- I. Embedded Model
- II. Appended Model
- III. Blended Model
- IV. Apprentice Model
- V. Student Centric Model

I. Embedded Model

In the year 2007, the DEI initiated **embedded model** of B.Com. programme in which while undergoing the B.Com. Programme, a student is also registered in Vocational Certificate in Modern Office Management & Secretarial (MOM & SP) Programme. The students were taught one course in each semester and by the time they complete B.Com. Programme, they used to get one more additional Certificate of MOM & SP with skills of Shorthand, Typing and Computer operations.



Later on since 2014, the students are offered Vocational Certificate programme in Office Assistant cum Computer Operator (OACO) programme along with B.Com Programme providing more employment opportunities to the UG students.

II. Appended Model

In this model students are given flexibility to register for a certificate programme in vocational stream which is aligned to the conventional degree. Like B.Sc. Computer Science students can pursue a Diploma/Certificate course in vocational IT.

This model complements the theoretical abstractness of conventional stream and gives opportunity to the student to have theoretical depth of the subject along with industry aligned hands on experience, thus making them more marketable.

Appended Model

- Degree(Academics/Skills)+Certificate(Academic/Skills) /Diploma/ Advanced Diploma simultaneously
- Associate Degree (skills) and Degree (Academics)
- Two diplomas simultaneously.
- Diploma and Certificate
- Two certificates

Figure-11: Features of Appended Model

III. Blended Model

Blended model at DEI is a unique framework where students can pursue Bachelor degree with Major in two vocational stream and minor in any allied conventional stream or vice versa. This model allows intra-transitions upto third semester.

Blended Model (Major and Minor)

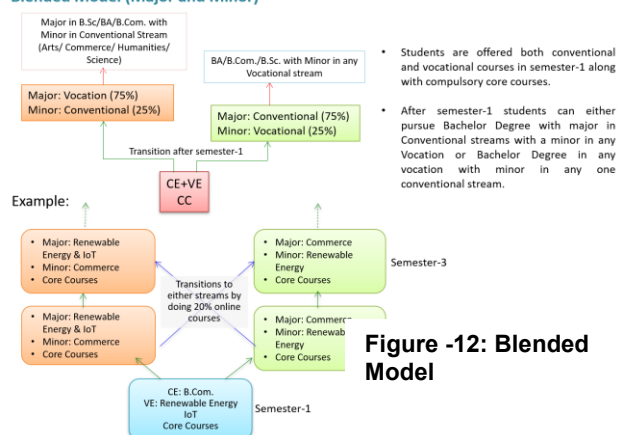


Figure -12: Blended Model

IV. Apprentice Model

In this student learns the theoretical concepts in class room setting and gets the hands on experience on those concepts in real industrial settings, which can be a mini plant, SKP, workshop or an industry. In this model the theoretical content is also aligned to the industry and gives students the experience of market and academia at the same time while keeping the educational organization in sync with the industrial/market needs.

Apprenticeship Model

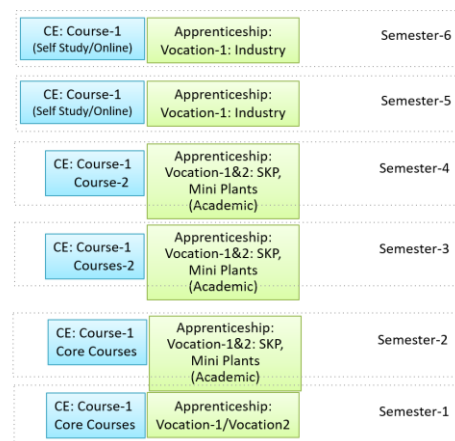
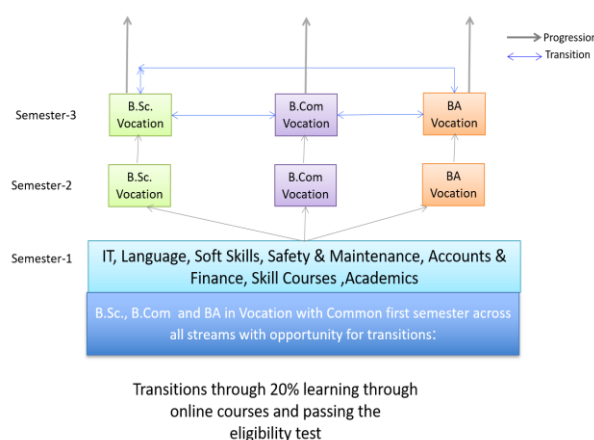


Figure-13: Concept of Apprenticeship Model

V. Student centric model:

This is a multiplexed model where students from all the streams study common courses comprising of language proficiency, IT proficiency, writing and presentation skills, core courses connecting to the community around and basics of finance, taxations and accounting. After the first semester students are free to choose any vocation. This brings students from diverse back ground under one roof resulting in idea sharing and fertilization giving rise to innovation. Presently, this model is followed for all the 21 B.Voc programmes at DEI.

Student Friendly Model



Transitions through 20% learning through online courses and passing the eligibility test

Figure-13: Concept of Student Friendly Model

10.1.2 Reforms in the existing Education System

- Faculty and trainers from industry to be recruited and paid as per their experience
- Completely subsidized programme with very low tuition fee. Existing conventional educational infrastructure is inadequate to cater to the ambitious objectives of the skilling framework. Separate and tailored facilities, mini-plants, workshops to be created.
- Skill missions of the states should be in the advisory role in identifying vocations and trades around which suitable B.Voc. programmes can be initiated in a particular region.
- Region specific content should also be made available online in regional language to encourage learning.
- All the vocational programmes to be converted into modular format i.e. trimester format in place of semester format \.
- The present admission system in which admissions are made yearly also needs to be changed and now admissions are to be made trimester-wise at least for B.Voc. programmes. This will facilitate the entry and exit of a trainee as per their convenience. A trainee is free to join the advance level vocational programmes after gaining some experience in the job thereby acquiring the opportunity for vertical growth
- The credits gained by the trainee in the previous vocational programme can be accumulated and thus he/she can continue further and obtain the advance level certificate/ diploma.
- The idea of vocational education to be given to the students at school level by introducing the customized vocational training in their curriculum.
- The number of seats in the vocational programmes is to be increased by 150 percent within next two years.

- x. The Vocational education/training opportunity to be provided to all the meritorious students, who have the desire for vertical growth through Lateral Entry scheme.
- xi. To build a National Skill Development Management System (NSDMS) using Information and Communication Technology (ICT) for on line registration, online result processing, result declaration, credit accumulation, credit transfer, issue of certificates etc. in the next two years.
- xii. The NSDMS will also take care of the record of placement of students or their new start-ups.
- xiii. As the DEI envisages the socio-upliftment of society, the Vocational Programmes are also offered in different locations of the country providing training to the local masses for the skill development by linking the Information Centres of the DEI under Distance mode with the Training Centres under the administrative control of DEI. The University and the Centres across the country will function in a hub and spoke model to ensure greater outreach. This will increase in the number of enrolments in the vocational programmes and will ensure the DEI purpose of serving the humanity by raising their living standards.
- xiv. The Institutions of higher learning will also provide the recognition to prior learning. The Recognition of Prior Learning (RPL) process would include a pre-assessment, skill gap training and final assessment leading to certification of existing skills in an individual.
- xv. Incubation Centre for the promotion of Entrepreneurship needs to be established in rural areas by local universities
- xvi. Universities should execute projects around the skills and needs of the rural community around it facilitate and nurture the rural economic developments and will connect these initiatives to the urban market and will be accountable for its sustainability atleast for two year.

10.2 Technological Interventions for the Enablement

Main objective of B.Voc programmes should be to strengthen the mandates of 'Make in India'. To achieve this, technology should be used to access, empower and connect the learners.

An online platform like MOOCSKENE BHARAT (मुस्काने भारत) of DEI is essential, which can host generic and region-specific contents in regional languages. For this active participation of State Skill Development Missions and the regional stakeholders is necessary. Every vocational degree programme should train or acquaint learners on the basics of web development and e-commerce.

Network of rural resource centers should be created in rural pockets with facilities for incubating ideas around the prevalent skill practices of the region.

Advertising media should be used to create awareness about the programme, its mandates and expected outcomes.

For sustainability of vocational programmes and their integration in higher education requires ownership from industries right from the school levels. Customized programme for the needs of our country with active participations from relevant industries of a region is compulsory to create model of circular economy which regenerative and sustainable.

To create a connected enterprise economy for the country, it is important to tap the rural human resource and create opportunity for lifelong learning through creative “cultural” education. Culture heavily influences the way an individual associate with the environment and the way of life. Therefore, it is important that ICT enabled rural learning centers with novel pedagogy be created which impart skill-based education linked to native culture and with reference to potential for development-oriented nano/ micro and small and medium (n/msm) enterprises or businesses- employment.

11. Why not every skill learner becomes an entrepreneur?

The dream of the Institute is every skill learner should be entrepreneur with difference and be the harbingers of new ideas for a progressive and sustainable global economy with benefits getting shared at every level of the society. Such change requires a mindset with broad and global business strategies with higher order thoughts. The ideas, work culture and life skills, which can initiate change leading to evolution of *homo-spiritualis* from *homo-sapiens*; a breed that higher order moral, ethical and spiritual values ingrained in them to facilitate decision making for a common good in an increasingly complex and intelligent machine-driven world. Such entrepreneurs will be personally pivoted to the ideology of fulfilling the needs not the greed with a techno-social lifestyle in perfect harmony with nature. This may seem today as a philosophical jargon, but in future this will be the much sought-after value in life which help the future manpower to balance and tread between the thin line of technology and humanism.