

# Lean Application to Education for improving innovation and Quality in Education

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## ABSTRACT

AICTE has published some of the engineering colleges are being noncompliant and will be closed. Students are really afraid that they will have to take admissions again and in those colleges where in there are vacancies, defeating admission process. The preparation for the CET and efforts are futile. We through Smart Incubation were focusing on lean in various field, this news followed by anticipated exit exam for engineering students forced us to take this as problem statement. The mandatory GRE score is accepted by students aspiring study abroad, but such exit exam itself challenges the status of the efforts, student put in. Unfortunately, the success and failure linkage to rank and rating has lot of ill effects including the suicides and nonemployment. All stake holders including the Priminster, education minister and students are looking for a batter method for evaluation, so we took this challenge, through SMART incubation. The lean concept is used for waste identification and minimisation with risk management. The concept got validated by monitoring mentored students' representatives in VAMNICOM cooperative management training, Smart team, Balak Seva Sangh and VIT Desh Department. The hypothesis is: identifying the method to differentiate interest and commitment, helps effective grading of students and no negative effects like frustration. With mentoring the students aligning their commitment to national goals. Motivating & evaluating the students through application orientation would not only help us in achievement of self-employed skilled students, but also help others to be employed. Research methodology is primary survey and the relation coefficient analysis also validation using the third-party assessment. The continuous interaction and three years monitoring and feedbacks from stake holders have proven and validated the hypothesis. We are sharing the same for peer review and similar applications in other fields.

**Key Words:** SMART incubation, lean tools, innovation, Examination, Policy application,

## I INTRODUCTION

Examination evaluates the process of learning, abilities and skills acquired and qualify the students for their career pursuits. If we analysed the pattern of past professional exam the % questions repeated and % pattern getting repeated the results are so surprising & defeats the main goals. The analysis shows a positive correlation

having the probability of more than 80% students passing the exam without acquiring the skills. At least for professional examination the evaluation of the acquired skills has to be tested, which is done through projects mostly mandatory in final year with students never working on their project as their commitment as either lack money or sponsors. So, does not really impact in a big way on their rating. Through SMART incubation we are mentoring the students for applying their commitment into a feasible product. This helps the students to be innovating and application oriented problem solvers. They have also develops products that are in line with Niti Aayog or national planning requirements that can be supported for venture capital development and enterprise development.

The students are selected based on their commitment than the educational skills. Representation from Balak Seva Sangh is pre-SSC students, VIT are first year engineering students – almost 12<sup>th</sup> Qualified, and VAMNICOM are PG students we consider as graduate qualified, Smart incubation allows individual wanting to develop their product, irrespective of the education, family, marital status or gender. Such representation and comparison is essential to have uniform evaluation criteria in our education system

The Balak Seva Sangh students were trained to basic skills like Computer, soldering, electrical repairs, based on the technical trends in their schools. The Vamnicom students focused on food related application and VIT Desh students focused on engineering application, while others are allowed any project of their interest using Lean techniques and focusing on social application. The basic problem-solving tools training is done for all. The SMART centre students took a challenge of Rescue home ladies being trained in Solar application. As they did not have any syllabus and that is a challenge addressing the solar initiative focusing on alternate energy and rehabilitation of the ladies, with help of VAMNICOM ED centre and woman Chair.

### **Introduction to Innovation hub & SMART incubation centre–**

Free entries with reference is given to anyone who wanted to be part of the innovation and incubation, based on their commitment evaluation review by mentoring, monitoring their attendance and participation. A dedicated gap analysis is done to map individual aspiration and current status review. The common topics for development are identified, and specialised mentors and career development plans are also defined. The career counselling, training and mentoring are the three methods used for this transformation and the grooming is through SMART incubation and outcome has resulted in an innovation hub, a name of their choice.

Other incubation avenues like Ten X club is taken as secondary reference from the website study. Our results are proven to be better than such centres.

## **II OBJECTIVES**

To study and relate the HBR (Harvard business review ) innovation related research to education, and teams in Pune, India.

To identify method to grade students not only linked to conventional examination, but more application oriented and has built in hand holding and mentoring to avoid negative consequences.

To develop dedicated teams that are committed and aligned to social and National goal for skill development and enterprise development.

Mentored committed teams for Nation building drives.

### III SCOPE & LIMITATION

This project is limited to primary study conducted on selected teams in Pune, although represented different regional students' participation, study conducted in Pune, so the results are restricted to the pilot and mentors and participants.

Being multivariant analysis further study for more batches will be conducted to validate the above results, for developing a rating system model.

### IV HYPOTHESIS

Identifying a method to differentiate interest and commitment, helps students grading.

The frustration or any negative effect is overcome with mentoring the students aligning their commitment to their career plan and national goals.

Clear action plan for career planning makes them confident and proud for their contribution than the ranks they get.

### V METHODOLOGY

A test is conducted to identify the commitment level, less than 70% is rated as interest, rejected 70 to 80 allowed for re exam with or without mentoring and more than 80% are subjected to grooming. The test was based on the project, application insight and creativity trait analysis with brainstorming to monitor their flexibility, originality, drive, & flow. The problem-solving ability was descriptive logical analysis of the problem, the brain writing and options selected. Those qualified were given application oriented challenges and ask to give 5 alternate solutions and feasibility analysis. Based on resources used and application, we could relate the commitment. Selected students were then trained on problem solving tools and techniques, irrespective of their background. Helping each other's was encouraged. The rating also monitored the help extended by the group, so a cohesive team of committed application oriented students is formed. Now irrespective of any external drive like funds sponsors, rating these students are sure to pursue their goals. They are subjected to survey evaluating their expectation, priority and future plans. Formal certificate, rating, award winning was bypassed by original application, problem solving and applying technology for society. The third-party analysis and awards are encouraged, and multiple competitions participation is also encouraged to minimise subjectivity. The multivariant regression analysis is as follows.

We could see an incubation centre is developed, where in the teams are more interested in problem solving using the research tools and lean application, for society. Data based on the surveys, interviews and finding of

the selected pilot team of 5 teams represented from selected organizations, with two teams from VIT, one team from VAMNICOM one team from Nivedita, Aadishakti and one team Smart incubation is selected. Based on the test to find out are they committed for this project based on their response and psychometric test, we started for monitoring their performance. The Harvard business review shows innovation is not only creativity, it is creativity for problem solving, emphasizing the commitment and problem-solving skills, ultimately the lean application. The intrinsic motivation is the major component to demonstrate commitment. The book mapping innovation by Greg Satell gives 4 steps. The studies in Google, MIT and Harvard support this. Setting the goal is easy, but the creating diversity is the major challenge for the academic institutes. The only attitude we need to encourage is team matters. The organisation as knowledge broker plays a major role in triggering the skills and abilities application and incubation. This advantage we got with SMART incubation and eventually it is proven more effective than other teams irrespective of education and resources back ground. This was initiated by allowing the leaders to choose the partners and team members, where in they can interact at least once a week and be monitored and mentored and trained.

Is this not a valid test for qualifying them for Engineering or enterprising efforts, M3 which was not liked by all of them when linked to statistics, probability based analysis and the various mathematical principles as applied to research, students developed interest in mathematics. The students are subjected to practical target of forming a pilot enterprise and solving a problem following successful projects took place evaluated by VAMNICOM team to award them entrepreneurship training and certification.

Sr. No.	Projects selected by Teams & the application	Application	Result
1	BOPEE agency for solar lamps	Rescue home ladies	70 out of 29 could demonstrate the skill irrespective of educational background
2	Bio Gas	Sarada math	Two teams from SMART incubation trained for house hold bio gas
3	Tooth cleaner & mouth wash	SMART incubation is sponsoring for application	Data collection is going on with VIT team
4	Waste Disposal	Vamnicom installed a demon plan for Energy training	One team from Balk Seva Sangh got involved
5	School Safety	One team from Smart incubation got trained as	ACCAB sponsored the project

		solution provider	
6	Nutritious food products	Sponsored by Katraj	One team of Balak Seva Sangh developed a café for such product outlet

Only restriction for topic for kaizen was to identify a problem that will have social application. A problem solving training and dedicated mentoring including counselling on positive thinking, lean management were the tools used for triggering the projects. The innovation and creativity modules are developed by experts in the field, but the application is monitored and mentored for SMART application – Socially motivated application of research and technology. Support from Engineering colleges and dedicated volunteers was also received. VIT, VAMNICOM and Sinhgad are the typical names. Industry teams included Mascot Pump, Mayura enterprises, Control touch, Intra Electronics, Wyse biometric system, Nehate electronics, and Nalco Champion.

## VI OBSERVATIONS & FINDINGS

Pre-mentoring analysis and finding of the team

Sr. No.	Projects selected by Teams & the application	Response from the team	Resources availability
1	Tooth cleaning	87%	90%
2	Air mask	62%	86%
3	Vitamin C and temperature effect on tomato	53%	90%
4	Self-sustaining Kitchen	89%	42%
5	School Safety	93%	95%
6	Patanjali type nutritious food products	90%	57%

Table 1 – Pre-project situation

After gap analysis of the situation following actions are initiated for selected members of team and individual and group interaction, counselling and mentoring plan as per the gap & need identified. The two-project based on resource availability and application are School safety and Kitchen level bio gas – modified self-sustainable kitchen, further included as part of incubation centre at VAMNICOM under their women chair and energy initiative, and food safety due to team pressure.

Sr. No.	Steps	Action Plan	Performance indicators
1	Set the goal with identified sponsors	By 2017 April	Sponsor for each project
2	Train on Problem solving	December 2017	Mini-project competed with application
3	Promote team work and psychological safety	All through out	Mentors report
4	Train on lean tools & creativity	By March 2017	IPR and application orientation
5	Mentor through out	All through out	Mentors report & students feedback
6	Demonstrate and develop alternate application by diverse teams	Twice a year, by national level competitions and IPR generation	Participation in National and International seminars

### Post training analysis to validate the hypothesis –

- Identified the method to differentiate interest and commitment, helps students grading.

Perception analysis of the stake holders relating the evaluation based on application and problem-solving commitment compared to examination based on perception analysis with mean of 4.5

Variance 0.81

and SD 0.9,

$r = 0.93$  showing strong positive correlation, so the first hypothesis is considered validated.

The distribution table is as follows

X	1	2	3	4	5	6	7	8	9	10
Ex	10/ 1024	45/ 1024	120/ 1024	210/ 1024	252/1024	210/1024	120/ 1024	45/ 1024	10/ 1024	1/ 1024

The positive correlation was considered more than 7 So  $P(X) \geq 7$  is, the negative response is 0.1719.

Amentor's report and attendance monitoring are a major attribute based on the professional judgement of the mentor and the attendance records and results achieved, we treat the hypothesis as validated.

Thefrustration is overcome with mentoring the students aligning their commitment to national goals. Is validated by evaluating the response after participating in a convention having awards and taking response of the students

their parents and teachers - Are they still committed, in spite of losing the opportunity to get the award, is there any relation between the award and learning and application.

There is a subjective element also the evaluation criteria also play a major role in award, this is proven with students not getting award in one competitions were awarded in other. This kept their motivation level high and made them realise the irrelevance of awards and rank and help them to be more focused on their work. Being committed the negative thoughts like frustration has not popped up. This has validated the second hypothesis

Out of 300 spaces, 80% responded and the coefficient of regression is positive 0.82 showing they are still committed. More than 72% have expressed the application has many opportunities and award is just one-time event.

Clear action plan for career planning makes them confident and proud for their contribution than the ranks and awards or cash incentives, funds allocation they get. The career plan is more important to them than the awards, ranks and marks. This is proven by 0.76 correlation coefficient.

We therefore conclude the hypothesis are validated.

The evaluation is application based and not on memory test or presentation fluency. The research and innovation are linked.

Social commitment and applications are considered as prime factors for selection of project such as Food link with cancer is being promoted so although this is not meeting our priority criteria same is added along with school level safety and bio gas project irrespective of external sponsors.

## VII DATA ANALYSIS AND INTERPRETATION

Mentors results could demonstrate the mentoring and commitment has direct correlation, in brief giving security to succeed is all the teams want. This develops intrinsic motivation. All the teams with little hand holding have resulted in considerable improvement at national and international level.

The innovation, originality creativity is within everyone. Only not explore due to type of expectations, interests and application orientation and mentoring, and method to rate the performance, life style and virtual world exposure or for various other reasons.

However, while developing the solutions and analysis creative participation, synergy effect and originality is noticed.

Although patents are considered as one of the criteria, team is more comfortable to share the knowledge without any IPR, they want the good things shall be multiplied for the society.

The most remarkable point is - no external grants and funds were utilised and individual members contributed for the projects, fees, and infrastructure.

We started the training with a simple board and chalk and later on, a laptop, LCD, Wifi , group app, hardware, soldering guns, boards, components, support organisations, institutes and industry association all was added as and when needed.

The centre is well established and willing to take different challenges posed by Niti Aayog, the Start-up ideas to make India proud. We are sure for this social engineering with help of the Lean, and simple problem-solving tools and creativity training and mentoring has a great contribution and can be rolled out as model for innovation development.

The development of individual and the team and society is a great contribution and we are proud to be members of this drive.

It is proven as in a team some focus drive & dedicated efforts to follow the value stream mapping and role model using science park Mysore centre has resulted in effective change management. The team was doubtful themselves about the results and their performance due to lack of proven success story. Now they are sure the simple difference in success, and otherwise is following a method, or a model and waste identification exercise. The experiments and development training in these lines has resulted in discovering the originality and creativity that was within them never explored before and then innovation was just an evidence driven fact, application of ideas not very difficult, are the feedbacks in nutshell.

Thus, a dedicated model for incubation resulted in Innovation hub that groomed the teams and developed projects that has positive impacts on society.

The typical awarded and proven projects include – Water purifier, MMI – Measure, monitor and improve devise with integrated risk and water management. Level controller with voting logic. Bio gas to salvage solid waste. The solar lamps for renewable energy. Access control based on biometric and integrated system. Various android based apps for distribution of agricultural products. Reduction of waste, by control at original level. Tissue culture and bio tech projects related to agro productivity. Safety of kids, senior citizens and other vulnerable member of society.

## **VIII SUGGESTIONS**

Such group development and interaction model based on technology park and mentoring, counselling analysis and hand holding for individual and group for synergy proven to be very effective and can be adapted by other and can be extended for remaining members also.

Projects in Hand includes and continues the same focus areas such as- school safety, Agricultural development by tissue culture and horticulture, app for farmers to consumer connect, common platform development, climate change mitigation projects on renewable energy, as biogas, solar lamps, stoves and maintaining disposal camps for clean India. Food safety and ancient wisdom exploring the science and technology.

## **IX CONCLUSIONS**

A dedicated mentor can initiate a change. Students, individuals are looking for change, and one can initiate and mentor the change by sparing little time for society, this is far creative than living in the virtual world of entertainments and social media. If adequate options are provided the teams are willing to get out of the routine, take up social challenges, address them with creative solutions and as a result a SMART incubation centre gets transformed into an Innovation hub.

Students are confident of their earning and willing to take up challenges of real life by setting an enterprise, now their training needs include enterprise development.

We through Smart Incubation centre started working towards this high-risk element and major social impact to find viable solution to minimise the risk and waste. The lean concept is used for waste identification and management.

Most important is the negative contributors to evaluation and learning system are identified and eliminated by applying lean management and better results and applications are evident.

## **X ACKNOWLEDGEMENT**

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