Agile Practices in Higher Education: *A Case Study*

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Abstract— **Indian higher education is looking forward to major reforms. In the past, much of the efforts to bring in reforms have proved to be counter productive. There is so much of wastage of talent and resources that one is compelled to think whether the agile practices that have met with so much of success in manufacturing and in software industry can be of any help in education sector as well. With this guided inquiry we carried out an experiment to practice few of these principles and the results are very encouraging. In this paper we discuss the motivation behind applying agile practices in higher education and the methodology adopted by us with the help of a case study.**

Keywords-agile in education; blended learning; higher education

I. INTRODUCTION

Currently the Indian higher education system is reeling under pressure and is badly in need of reforms. Regulatory bodies such as University Grants Commission (UGC), All India Council of Technical Education (AICTE), and Medical Council of India (MCI) etc. have been ineffective and their very role and existence is being questioned [1]. Every day one reads about education system that has failed to deliver. A report by the software industry group NASSCOM, that represents and sets the tone for public policy for the Indian software industry has declared that 75 percent of Indian engineering students are unemployable [2]. UGC has sent a dictate to every university/college to establish a Quality cell on the campus to monitor various educational processes. National Assessment and Accreditation Council (NAAC), a rating agency for academic excellence across India has come up with an assessment framework for the colleges and universities [3]. Every five years, Universities and Colleges have to voluntarily undergo this exercise to help them assess their performance vis-à-vis set parameters. During the appraisal phase, the institution puts tremendous pressure on its limited resources to prepare documents and at times manufactures them to meet the compliance process. NAAC accreditation is important because it is tied up to the funding. Not in the distant past, we faced similar situation in software industry wherein every software company worth the name was yearning for ISO/CMM certification. Interestingly, education is people intensive activity just like software development and both share lot of common concerns. In this paper, we have argued in favor of applying agile practices in education system before it goes through mindless, heavy process oriented quality framework. In the end, we have reported a case study wherein we applied these principles in a traditional university setting to deliver quality education in record time with limited resources at our disposal. Shorter version of this work has been presented in a conference on Technology for Education [4]

II. MOTIVATION

Communication and collaboration between software development team and the customer is the key to quality software. It helps the developer to get to know the real requirements of the customer. This focus on the customer is often missing in education. In an education system, at the input end student is our customer but at the output end industry should be our focus [5]. However, we do not see much collaboration happening between the industry and academia. Each one blames the other but the blame game does not fix the bug. We see frustration at either end. Instead of addressing the real problem, industry is looking for quick fix solutions by organizing finishing schools. But fact of the matter is, it takes minimum 3-5 years for the university to change its syllabus. The academic curriculum is often designed as if all students are going to be researchers. Students learn many subjects just in case they may need them in future. Year after year teachers go to the same classroom, teaching the same subject often from the same notes, repeating the same anecdotes without any proper feedback whether this age old method of teaching is still effective. Teacher is an expensive resource not so much in terms of the salary that he/she draws but the kind of harm that they can cause for not doing their job properly. Teacher accountability is important but it can not be simply measured through clock hours. If 75% percent of the output is a reject, which industry can afford to overlook the delivery process and not put an end to the wastage?

Three key processes in any education system are teaching/learning, evaluation and administration. Currently so much of rework, redundant work and irrelevant work is happening in each of these areas that we thought agile principles can help us in reducing this wastage and bring in more productivity at both individual level as well as at the institution level. Education being concurrent subject, it is of interest to both the state and the centre. However, it often suffers from the common malady, who should take the initiative. Due to its territorial structure, it creates a master slave relationship rather than equal relationship. This often results into inordinate delays in implementing new policies. Interestingly, university and its affiliated colleges share similar kind of relationship. The syllabus is designed by the

university body but its implementation is carried out by the affiliated colleges. Teachers and students belong to the affiliated colleges and have very little interaction with the university except may be during the examination and convocation. For any system to continuously improve and deliver there has to be constant feedback from all its stakeholders, which at present is missing in our education system. There is so much of bureaucracy that is built into the system that unless there is a provision in the ordinances, no change can be made. Often the ordinances are quoted as if they are some sections under Indian Penal Code. Just like high quality software cannot simply be produced by mere compliance process, quality education cannot happen by following bunch of rules. When old rules do not deliver one ends up making more rules and every body is kept busy either in making new rules or checking who is violating the rules. Simplicity in design is the key whether it is education system, software or for that matter legal system. Not everything that is doable need to be specified in the form of rules. We see a problem of over specification in the university ordinances that leaves very little flexibility during implementation. The term often referred in academic circle as "hands are tied". Approving the ordinance or making any change to the ordinances is a long ceremonial process taking several months and some times even years. The recent report submitted by National Knowledge Commission (NKN) to the Prime Minister of India calls the Indian higher education system, as a whole, over-regulated but under-governed [6]. In short, the system has very long turn around time and demonstrates a classic waterfall delivery model.

When Goa Govt. approached Goa University to provide training and certification to 500 computer teachers working in 350+ schools spread across length and breadth of Goa, we did not have the luxury of time and resources. In a matter of two months we had to design the curriculum and start delivering. Unfortunately, the decision of the Govt. to train the teachers was political, based on a long struggle and strike [7]. In the past these teachers were hired on a contract by multiple agencies to "teach computers" to school children. Since the department of education did not have in place a policy on computer education, as a short term measure, it outsourced the entire training program to a private agency. The private agency hired computer teachers on contract for several years till they went on to strike and demanded Govt. jobs and regularization of their services. By then they had formed their own union and were being supported by union labor leader. Majority of these computer teachers were graduates in Arts and Commerce and did not have any formal qualification in either IT or in Education. The Govt. too under the political pressure decided to regularize them with a condition that they qualify as per the university laid curriculum and procedure. This is yet another case of typical Govt. functioning wherein a quick fix solution to address one problem results into a greater problem in the near future. When the university appointed the author as the coordinator of the program, the first challenge was to put together a core team to work on the project. We have had no experience in designing a course for working professionals. The normal

university ordinances are very rigid on attendance and here we were trying to fit in working professional with 90% being married ladies with young children and family to look after. The normal university procedure would take several months to design the curriculum and get it approved by the authorities. This is where we thought of using agile principles to design and deliver in short cycle's, by continuously taking feedback on our performance. The rest of the paper is about our understanding of agile and how we fulfilled this challenge by adopting it.

III. UNDERSTANDING LEAN AND AGILE PRACTICES

Lean practices have its roots anchored in manufacturing [8]. Its primary objective is to reduce product development time, optimize on utilization of resources and give maximum benefit to the customer. Although many practitioners may not differentiate between lean practices and agile practices, we informally understand that lean practices are system wide practices where as agile practices are more to do with specific project, much like local optimization. The most important principle in agile is to take continuous feedback, learn from the previous iterations and try and improve in the next iteration. The agile manifesto [9] provides guiding principles to resolve the conflicts that may arise during the development. Agile has no rigid rules. There is no concept of best practices. Better and better practices will keep on evolving as developers master the art of development and the development environment. Agile means taking risk. In the process one may make mistakes but the most important thing is to detect the mistakes early and fix them as soon as one can.

With the expansion of engineering education in the last decade, our classrooms have grown in size. Old methods of teaching/learning are no longer effective. We are looking for scalable/engineering solutions in education. We see plenty of scope for applying agile principles in three key process areas in education. In the literature we see limited references to lean/agile practices in higher education [10]. But there are forums and blogs where people are informally sharing their experience of using new technology for active leaning [11]. We see great potential for clicker [12] technology in classroom teaching/learning, particularly when eye contact with individual student is difficult. With this background we thought of defining guiding principles for using agile in education, on the lines of Agile Manifesto [9]. Due to lack of space we are only listing the principles and continue with our story on how we could practice these principles in education.

Agile manifesto in Education
- Teachers and Students over Administration and Infrastructure
- Competence and Collaboration over Compliance and Competition
- Employability and Marketability over Syllabus and Marks
- Attitude and Learning skills over Aptitude and Degree

We all agree that that there is value in items on the right but in agile education we would like to see more value on items on the left. Similar sentiments are expressed by the authors in [13].

A "computer teacher" is rather ambiguous term in the current context. Therefore we shall call the computer teachers to whom the training was being organized (trainee) as candidates and the computer teachers or education teachers who were involved in training (trainer) will call them as instructors.

The Govt. of Goa made available the funds in the month of May 2008. The first meeting of the core project team was held in the last week of May 2008. A white paper was prepared outlining the curriculum. It consisted of 4 course modules in the subject of Information Technology (IT) and 4 course modules in the subject of Educational Technology (ET). The exact syllabus of each module was not defined at this stage. The course was scheduled for 4 semesters with each semester having one course module each on IT and ET. Each module was expected to have both theory and the associated lab. Keeping in view the number of candidates and their geographic spread, we decided to use ICT to the maximum extent possible in all three key areas i.e. teaching/learning, evaluation and administration. Immediately an eLearning portal was created hosting learning management system (LMS) Moodle [14]. A blended eLearning [15] delivery model was chosen since many of the candidates were getting back to formal education system after a gap of 8-10 years and were not self motivated enough for pure eLearning delivery model.

We also observed that majority of the candidates were academically weak, with low self esteem and confidence. They were also apprehensive of the university examinations. We decided to take the candidates into confidence by announcing a program launch meeting in the presence of Chief Minister of Goa in the last week of June 2008. During the meeting we explained our delivery model. We had identified 11 colleges affiliated to Goa University to work as study centre, one centre in each taluka[1]. Centers were chosen based on their ICT infrastructure and IT staff. Each candidate was expected to visit a particular center each week for total 12 hours, (6 hours of theory and 6 hours of lab) for a face to face session. Candidates were told that they would have to visit the course portal regularly in order to access all the latest information related to the course. Fortunately, the Govt. of Goa had provided the Internet connectivity to every school under a central Govt. scheme by providing data cards. During the launch of the program we gave a demonstration on how to login into Moodle and access the weekly

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[1] A taluka is an administrative division of state and it generally consists of a city or town that serves as its headquarters, and a number of surrounding villages.

information related to a particular course module. Candidates were also told to register for the course on Moodle and upload their personal information.

In order to establish a baseline, we decided to hold a pre-test at the beginning of the course. The pre-test was used like a smoke test in software testing. It contained 100 objective questions on English language skill, aptitude for teaching, knowledge of IT and aptitude for programming. The test was conducted in 11 colleges, on a Sunday. The objective of the pre-test was to understand the logistic involved in concurrently conducting the examination in all the 11 colleges on a Sunday and also to check the suitability of using Optical Mark Recognition (OMR) technology for automatic evaluation. Since evaluating 500 answer papers manually would delay declaration of the results, we were contemplating on using OMR technology for all examinations. But there was a difference of opinion within the core team. Our colleagues from the field of Education strongly felt that the objective method of evaluation is not suitable for the subjects like Education and subjective test is a must. Competency [16] based syllabus was defined for each course module at the beginning of the module. A post-test was planned to measure learning outcome [17].

The real test of our model happened during the first semester end examination. We found that our normal ordinances related to continuous evaluation, mandatory 75% attendance and relative grading etc. all went for a toss. In addition we found that the candidates resorted to copying. Since the course was conceived on the request from the Govt. after a long struggle and a strike by the candidates, it was looked upon by the candidates as merely a hurdle to be crossed before getting the Govt. job. Interestingly, the candidates had garnered enough sympathy during the struggle period and we noticed that right from the supervisor to the peon at the center, everybody was eager to help them during the examination. This is where we realized that we cannot apply normal university model for evaluation. The model was not scalable and it was difficult to enforce it in the hostile environment. On the other hand, the candidates wanted these examinations to be treated like in service training that everybody passes and given a certificate at the end [18]. There was a conflict of interest. This is when the core team had several meetings with union members. The purpose of the meeting was to resolve the conflict, come up with new set of rules that would be easy to understand and easy to implement. It took quiet a while for the core team to convince the candidates that this was in their own interest and we were only helping them to achieve their objective.

A. Teaching practices

In the normal course of events, university would have just defined the ordinances and the curriculum and requested the affiliated colleges to transact the syllabus. Each individual teacher in the college would then prepare the instructional material, duplicating efforts across all colleges. A common examination to be conducted by the university

would take at least 20 days and another two months before the results are declared. Since these were working professionals trying to learn in their spare time, we anticipated problems in using typical university model.

To avoid duplication of effort in creating instructional material, we formed a small team of subject matter expert for each subject to be taught. Content preparation included slides for classroom teaching and exercises for the lab. The team was distributed and one of the core team members was coordinating the effort in finalizing the content before uploading it on the Moodle. The content was uploaded just in time (7-10 days) before it was required by the instructors at the centers. As far as possible we used open and free content from the Internet rather than creating our own content from scratch. This also helped us in keeping our content production cycle short. Much of the content was self sufficient and could be used for self study. We also created two discussion forums on the Moodle, one for the candidates and one for the instructors. Since the same content was being used by all the instructors and the candidates, we could immediately get feedback through forums on any mistakes in the instructional material. Interestingly we found that the candidates were more eager to use forums and solve each others difficulties. Only few instructors regularly visited Moodle and participated in forum discussions and chat. In case the instructor could not conduct lecture/lab during a particular week or candidates were not happy with particular instructor, we would immediately come to know about it through forum.

B. Evaluation Practices

In a university system Examination is a big ceremonial process. For every exam there are several appointments made such as Chairman of examination, paper setters, moderators, paper evaluators, supervisors, block supervisors and so on. Typically three sets of question papers are submitted by two or three subject matter expert in the form of a manuscript. This manuscript is then opened by the chairman of examination who then decides to moderate/compose the final paper which is then sent for printing. In spite of this elaborate process, you do here about paper leaks because questions are scanned by too many eye balls before they land in the hand of the students. We also find it funny when we see the same process being used by the examination section, whether there are 3 students or 30 students or 300 students answering the examination. There is so much of irrelevant work that happens under the cover of confidentiality that teachers are busy all through the year either setting paper or evaluating/re-evaluating the paper for some exam or the other.

As mentioned earlier, we had decided to use OMR technology and set objective questions for all IT related subjects. The ET instructors after the first semester debacle realized that they wanted subjective questions in order to check the candidate's ability to express. But the candidates were heavily banking on the notes and the probable questions supplied by the instructors. When the expected questions appeared in the test they would either write by hearted answers or look for notes to copy. Since ET instructors realized that their objective was not being met by the subjective test, they also fell in line and agreed to test ET subjects objectively. We got convinced that objective test can be set in any subject but setting good objective questions is as challenging as preparing good unit test in software. Each question should precisely determine what the candidate has understood or not understood. From administration point of view there was a sigh of relief because like IT papers, ET papers could also be corrected using OMR technology. We followed a standard procedure of uploading all the answers to the question on the same day after the exam. This brought in complete transparency and helped candidates to calculate their own score. There was no need for asking for any re-evaluation etc. Within two days of the exams we could upload the test scores and those who failed could prepare for the retest scheduled after a month, at the beginning of the next semester.

C. Administration Practices

In a university system there is a considerable delay in payment to the teachers for their services during examinations or guest lectures. One of the reasons for this delay is the archaic procedure of raising the bill. Bills for a particular exam are sent to the finance section for payment only after taking signatures of all the examiners and the claim is certified by the chairman of the examination. Often due to one signature bill remains pending. In a normal course of events it takes around 4-6 months before payment is received by the individuals. The story is not very different towards payment to guest lecturers. The amount paid is also paltry and not very attractive. These are few of the reasons why not many teachers are enthusiastic about taking up extra work related to examination or guest lectures.

In our course we kept attractive remuneration for lectures and examination work. We established a central administrative cell with just one office staff to handle all clerical work. We published on the portal the mobile and landline number were one could contact for any query related to the course. The central cell had just enough space for holding meetings for 7-8 persons and was equipped with OMR scanner, printer cum photocopier and a LCD projector. All question papers including the final certificate were printed in house. At any point in time there were about 25 instructors handling theory and lab for the IT and ET subjects. We maintained a list of their contact numbers and the same was published on the portal. All announcements related to the course were made through Moodle. All exam forms were downloadable from the portal and were submitted at the centers. Most candidates never visited the university. All the funds and payments were managed from the university end. Since we did not have any control to change existing procedures in the finance section of the university, we created a virtual team by involving Finance officer and one of his office staff as members of our administration team. Similarly each Principal of the college

was appointed as centre coordinator. The centre coordinator were made responsible for appointment of instructors, keeping attendance of the candidates, making sure that lectures and exams are properly conducted and all the bills are raised and sent to the university on time. Center coordinator and one of his/her office staff were also members of the virtual administration team. All virtual team members were given monthly honorarium for carrying out work related to the project. Since it involved their own payment, all bills related to the project were cleared speedily.

After the copying incidence, we devised our own procedure for conducting the examination. We created four different sets of question papers for examinations by jumbling set of questions and the options. All question papers were printed just two days before the exam. We appointed faculty members from the university as observers. The role of the observer was to collect the question paper on the previous day, make sure that exam is conducted properly, make payment to all staff involved during the exam and bring back the OMR sheets to the central cell. All payments related to conducting of theory exams were settled on the spot.

V. FINDINGS

A. Achievement Tests

1) Pre-test & Post-test

Pre-test and post-test were used to measure knowledge gained by the candidates by participating in training course. The pre-test contained set of objective questions to determine basic knowledge of English, IT and aptitude for teaching. After the completion of the course, participants were given a post-test to answer the same set of questions. The pre-test was taken by 489 candidates and the post-test by 480 candidates. In all 458 exact matching pairs, where scores of candidates were available for both the tests, were considered for the analysis. The remaining values were discarded for various reasons such as some candidates had dropped out or were absent for one of the two tests. There were two differences in the conduct of the post-test as compared to the pre-test: i) the candidates had to answer the post-test immediately after the end semester theory paper ii) the time given for the post-test was one hour as compared to 1.5 hours for the pre-test. This may have led to factors like mental fatigue and lack of time affecting the performance at the post-test. Effect of these factors has been neglected for the purpose of analysis. On the other hand, the post-test was given as a surprise test and a two year period had elapsed between the pre and post tests, making it impossible for the candidates to remember the solutions. The Cronbach's alpha coefficient of test reliability was 0.89 [19] for the test.

Table I. shows the ranges of scores and the percentage of candidates in each range at the pre-test and post-test.

TABLE I. % OF CANDIDATES IN A GIVEN RANGE OF SCORES FOR PRE-TEST AND POST-TEST

Score in %	Pre-test	Post-test
	% of candidates	*% of candidates*
>= 75%	5.90	10.26
>= 60% < 75%	26.20	24.89
>= 45% < 60%	48.03	42.13
>= 35% < 45%	15.50	16.38
< 35%	4.37	6.33

Table II. Shows the values from statistical tests.

TABLE II. VALUES OBTAINED FROM STATISTICAL CALCULATIONS

	Mean	Standard Deviation	Standard Error of Difference of Means	t-value
Pre-test	54.56	12.52	0.88	0.08
Post-test	55.25	13.97		

Using a one-tailed test, the t critical values for rejection of the null hypothesis at 0.05 and 0.01level of significance for 400 degrees of freedom are 1.65 and 2.34 respectively. Since, the obtained t-value is less than 1.65, the null hypothesis is accepted. Table III. shows the mean scores in each of the four learning outcomes for the pre-test and post-test. The mean scores are very much constant. Figure 1 shows the class frequency distribution of scores for the tests.

TABLE III. MEAN SCORES UNDER EACH LEARNING OBJECTIVE FOR PRE AND POST TEST

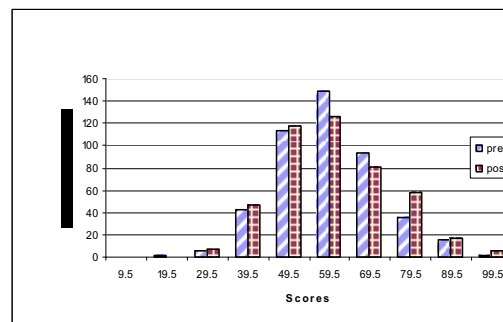|	English Language Skills	Aptitude for Teaching	Knowledge of IT	Aptitude for Programming
Pre-test	14.14	10.33	17.84	12.25
Post-test	14.01	10.04	19.62	11.58

Figure 1. Class Frequency Distribution of Scores

This test being more of an aptitude test, the findings are consistent. The results are borne out by field interviews with the faculty, wherein roughly 40% of the candidates were found to be not enthusiastic or responsive to the course [20] and had completed the course as a matter of requirement for job regularization. However, there were qualitative gains in terms of change in attitude towards learning, exposure to subject matter, and increase in

confidence levels and so on. The end of the course feedback presented in Table XI summarizes these gains.

2) End Semester Achievement Tests

Table IV. shows the mean scores and standard deviation at the end semester tests and Table V. shows the percentage of candidates falling within particular range of scores.

TABLE IV.   MEAN SCORES AND STANDARD DEVIATION AT END SEMESTER TESTS

	Sem1	Sem2	Sem3	Sem4	Overall
Mean	59.80	59.18	65.98	65.69	62.15
SD	8.75	10.90	10.55	10.50	10.57

TABLE V.   % OF CANDIDATES IN A GIVEN RANGE AT END SEMESTER TESTS

Score in %	Sem1	Sem2	Sem3	Sem4	Overall
>= 75%	3.61	8.63	20.88	20.08	9.84
>= 60% and < 75%	45.38	35.54	48.39	48.59	46.39
>= 45% and < 60%	47.39	45.98	26.91	28.11	40.56
>= 35% and < 45%	1.81	7.63	1.41	0.8	0.8

The above tables show that the performance improved as the course proceeded into the second year. Initially, there was a lot of resistance from the candidates to being subjected to a rigorous training regimen and examinations. By the second year, there was a change in their mindset and attitude. Field interviews with the candidates revealed that they had got used to the routine and, more importantly, found the course to be beneficial and were determined to excel. The instructors also corroborated these findings. This change of attitude reflects in the improved performance in the second year.

Table VI. shows the alpha coefficients for the end semester tests.

TABLE VI.   COEFICIENT CRONBACH ALPHA FOR END SEMESTER TESTS

Component	Sem1	Sem2	Sem3	Sem4
IT	0.73	0.91	0.87	0.88
ET	--	0.87	0.84	0.84

B. Feedback on Use of Moodle

The first feedback was obtained in August 2008, five weeks into the course. There were 485 respondents. We wanted to investigate frequency of usage of Moodle, log-in issues, connectivity problems, and participation in discussion forums.

Table VII. summarizes responses to the question "Do you visit the course website and Moodle? ". Table VIII. summarizes responses to the question "Do you think using

Moodle in course delivery is a good idea?". Table IX. summarizes responses to the question "Have you used student forum feature in Moodle? ". Table VII. shows that almost 80% of the candidates had begun to use Moodle quite regularly 5 weeks into the course. Table IX. shows that almost 71% found that using Moodle in the course was a good idea. The feedback also indicated that about 71% of the candidates could conveniently download the course material. The remaining candidates had to depend on the centers and their colleagues for getting the material. By the end of the first semester, 23.5% candidates had participated in discussion forums and 17% candidates participated in the term-end on-line feedback. The data from the feedback was substantiated by analyzing the Moodle usage logs.

TABLE VII.   RESPONSES ABOUT VISITING MOODLE

Response	No. of Participants	% of Participants
Sometimes	117	24.12
Regularly	293	60.14
Never, I have registered but cannot login	52	10.77
Never, I have not registered	12	2.47
Missing	11	2.27

TABLE VIII.   RESPONSES ABOUT USING MOODLE

Response	No. of Participants	% of Participants
Have not used much	44	9.07
Very good and want to learn more about it	231	47.63
Not a good idea due to connectivity problems	56	11.55
Good idea in spite of connectivity problems	120	24.74
Missing	34	7.01

TABLE IX.   RESPONSES ABOUT MOODLE FORUMS

Response	No. of Participants	% of Participants
I don't know what it is	70	14.43
Used it and found it useful	113	23.30
I know of it but did not use	239	49.28
Used it but did not find it useful	15	3.09
Missing	48	9.90

C. Qualitative Feedback at the End of the Course

A comprehensive feedback was taken from the candidates about all aspects of the course, including modules and topics that were useful, personal problems faced by candidates, and their perceptions of the course. 484 candidates participated in the feedback.

Table X. summarizes the ratings given by the candidates on a scale of 1 (poor) to 10 (very good). 64 candidates did not respond.

TABLE X. CANDIDATES' RATING OF PGDCET COURSE

Rating	1	2	3	4	5
No.of Participants	2	2	4	4	10
Rating	6	7	8	9	10
No.of Participants	33	40	95	61	169

Table XI summarizes responses to the question "How has the program benefited you as an ICT teacher? TICK the options that are applicable to you."

TABLE XI. RESPONSES TO QUESTION ON BENEFITS OF PGDCET

	Increased knowledge of subject matter	Increased hand/ lab skills	Improved style of teaching	Increased confidence to take on new challenges
No. of responses	215	103	199	279

Candidates' responses to some of the open-ended questions are summarized below:

Q1) What were your sentiments and reactions about the course at beginning?

94 participants did not reply to this question. Of the 390 respondents, almost 75% viewed the course with some misgiving initially.

Q2) How do you feel about the course at the end?

Almost cent percent of the 436 respondents spoke positively about the course on completion. Candidate's replies to the above questions are reproduced below, which typify those of many others.
At the start: "I was skeptical as to whether I would be able to get through this course when I saw the different topics we were to study, especially programming. Also, adjusting my studies with the studies of my children was a major hurdle I thought I would face."
At the end: "I feel proud that I have excelled in all that I have done. During these 2 years, I have gained a lot of knowledge which will help me in my teaching career. The course was well-planned and systematic."

Q3) What were the limitations of the Course?

A common limitation mentioned was that syllabus was too vast, particularly in IT. IT practical were not conducted to the satisfaction of the candidates and the candidates would have preferred more time for practice.

Q4) How do you find MCQs as a means of testing?

109 candidates did not respond to this question. Almost 90% of the 375 respondents favoured MCQs as a means of testing.

Some of the other useful suggestions from the candidates were that the course should be kept online for any teacher and similar training especially in E-Learning content development should be given to all school teachers.

D. Feedback from Faculty

At the end of one year, IT and ET instructors were given a questionnaire to measure different aspects of their experience regarding the course. Questions related to readymade content, pre-planned and uniform lecture schedule, and their individual experiences in the classroom were asked with responses measured on a 5-point Likert Scale (SA-strongly agree, A-agree, NAD-neither agree nor disagree, D-Disagree, SD- strongly disagree). Open-ended suggestions and observations were also invited. 20 instructors participated in the survey. Table XII. shows the feedback from faculty and the number of respondents.

TABLE XII. FEEDBACK FROM FACULTY SHOWING NUMBER OF RESPONDENTS

Questions	SA	A	NAD	D	SD
Use of technology in teaching -learning is a necessity today	14	5			1
Participants in regular university courses should have a common meeting place like Moodle	8	11	1		
I am comfortable with the use of on-line discussion forums, chats to keep students engaged	3	9	6		

95% of the faculty agreed that use of ICT and LMS are necessary in regular university courses in order to share teaching resources and to bring together the teacher/student community offering similar courses at different colleges. Almost 90-95% agreed that readymade content and pre-planned lecture schedules would ensure uniform coverage of topics, and transparency and proper compliance in delivery for regular courses, too. The concept of central team for content development was also well liked as this would help to share the expertise of senior teachers. On the question about being comfortable in keeping the student community engaged on a LMS, 3 respondents were very confident, 9 somewhat confident, 6 were undecided and 2 respondents declined to answer.

Non-participation by instructors in online discussions was a major drawback. Few ET instructors participated in Chat and Forums. The instructors were provided orientation on use of Moodle. However, training on using technology in pedagogy, and peer support for instructors was not provided [21]. This probably was a reason why the instructors did not participate in on-line interactions.

VI. DISCUSSION

Today IT provides enough opportunities in the field of education to be more innovative, more creative and make teaching/learning experience more meaningful and enjoyable. In rapidly changing world, agile learning is the need of the hour. With the advent of Web 2.0 it is possible for an agile learner to learn any subject on one's own. The industry is also seeking candidates with agile mindset. However, the traditional higher education set up is yet to benefit from the agile teaching/learning paradigm. An early exposure to agile learning environment can provide an opportunity to create engaging learning experiences that can create realistic workplace environments, enabling better support for student transition to the workplace. In this paper we have argued in favor of applying agile practices in higher education. We have also proposed agile manifesto in education on the lines of original agile manifesto proposed for software development. The case study presents our experience in practicing agile principles in a hostile environment. Rather than defining all variables right up front, we defined things just in time as and when they were needed. Whenever things did not work as expected we changed the things to suit the situation keeping the customer in the focus. We iterated over semesters to improve on our delivery. Although the scope of our project was limited, it gave us an opportunity to try out an alternative model of delivery that was more responsive, less resource intensive and created a feel-good factor to boost the confidence level of the candidates. In future we would like to see more educationists take the risk and experiment with agile principles in the area of teaching/learning, evaluation and administration.

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