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IARE-BuildIT Tool: A Case Study of an Online Platform Approach to Improve Coding Skills

Gandikota Ramu*

Department of Computer Science & Engineering, Institute of Aeronautical Engineering, Telangana, Pin-500043, India.
Corresponding Author

Abstract

The quasi-experimental design is used to investigates IARE-BuildIT Tool's impact to build problem-solving power of coder by motivating himself to accomplish and work with online coding platform approach. IAER-BuildIT is an online coding tool to solve students coding problems from anywhere using internet facility and computing machine. It does not require any plug-in or software; it works merely accessing the URL. In this case study merely 7000 Institute of Aeronautical Engineering (IARE) students are involved. The experimental duration is twelve months. By using measurable methods, the outcomes are proved to be impressive by encouraging students for online coding accomplishment, and by showing the proper problem-solving power of students to build code easily. Prominently, the results evidenced that, students involvement and their coding efficiency are increased with this online coding platform approach. Ultimately, this case study has suggested many convinced recommendations for online coding and problem-solving in engineering education.

Keywords: Online Coding, Education, Evaluation and Students

INTRODUCTION

Nowadays, Information and Communication Technology (ICT) is acting as a significant task in promoting excellence & support in engineering pedagogy system. The Indian government has taken lead to introduce ICT at all levels of education including schools, by establishing computer laboratories with internet facility. This approach helps every student to learn and improve his knowledge without any boundaries, and at the same time ICT introduces various latest teaching-learning processes in Indian education system(S.A. Chapman 2016).

Online coding platform has been recognized as an innovative training strategy that allows students to solve coding problems almost from anyplace and at any convenient time (Cavus et al. 2011; Huang et al. 2012; Kukulska-Hulme et al. 2008; Elizabeth A. Gazza 2017). Using laptops and tablets will give various training benefits: flexible, portable, less expensive and user-friendliness. Notwithstanding some difficulties, like network quality dependency, online coding platform has been recognized as a practical tool for addressing and improving coding skills of students (Thornton et al. 2005). This system will reduce the faculty work and time.

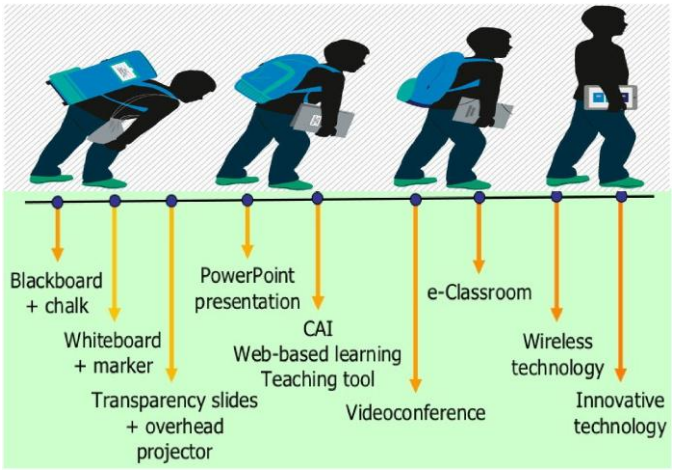


Figure 1. Evolution of Learning – Use Technology for Teaching and Learning

As shown in figure 1, the teaching-learning process is evolved from Black board and chalk to ICT. Still, more than 70% of schools and colleges are using black board teaching methodology. Technology revolutions make education system much stronger. Now, the students can learn anything what they want using ICT. ICT provides students an easy learning method which is understand the concept rather than remember. Online evaluation system evaluates very accurately nearly 99% and produces results at earliest possible which allows students to improve the quality of learning.

BACKGROUND

In India we have a multi-layered regular education policy with nearly 0.3 billion students are (MHRD 2016) registered in approximately 1.6 million schools and 39000 colleges providing 28 million UG and 4 million PG students [MHRD 2017]. India is one of the largest higher education systems in the world. **[batla 2017]**.From 1990s onwards, several education systems are slowly showing interest to adopt Classroom Response System (CRS) to conduct multiple-choice questions (MCQs) using clickers devices. Recently, online responsive systems are becoming famous like Edureka, edX and many more. From the huge collection of mobile apps and websites, Socrative is the Student Responsive System (SRS) which is widely accepted by both students and teachers (Haintz et al. 2014). The Socrative platform is an online

assessment tool to conduct exams like MCQs, true/false type questions and short answers. The students can access exams by using web browser enabled devices like tablets, mobiles and laptops. It also supports online feedback system which provides students reports in a more visualized way to analyze students performance in a most natural manner (Dervan 2014) . The advantages of this system are accurate, quick and more virtualized reports.

Most of the research analyses shows that, it provides active learning (Gauci etal.2009; Pettit etal.2015), promoting intercommunication in the classroom (Dervan 2014), confirming an increase in attendance, participation (Cubric et al., 2015; Fitzpatrick et al. 2011; Guerrero et al. 2013), student motivation (Frías et al. 2016), and improvement of student performance (Trindade 2014). The students are showing interest towards these kind of classroom learning environment (Kaya et al. 2016; Pettit et al. 2015). The literature survey reveals a common trend of Socrative practice exercises with the educational methods those are to be conducted in the conventional classrooms.

The present work concentrates on online coding tool that offers the learners, the possibility of solving coding problems online. The online coding platform allows the faculty to upload problem statements along with all test cases and constraints (Babaali et al. 2015; Chow 2014). The students should solve the problems by matching the output with given test cases. If any violation then it displays an error message like "wrong answer" (Stowell 2015).

IARE-BuilIT Online Coding Platform

System Design

The proposed framework BuildIT online coding platform is mainly involved three modules namely instructor module, administrator module, and student module as shown in figure.2.

a. ***Instructor Module:*** This module is faculty end module. Here, the instructor can upload program description along with test cases and constraints. The instructor can upload any number of problems, and he has the choice to set clock time. Based on the difficulty, He can set the marks to each problem. In BuildIT platform, problems are divided into three categories hard, medium and easy based on the number of students solved a problem, if maximum number of students solved the problem then it is considered as easy level and if minimum number of students solved the problem then it is considered as hard level.

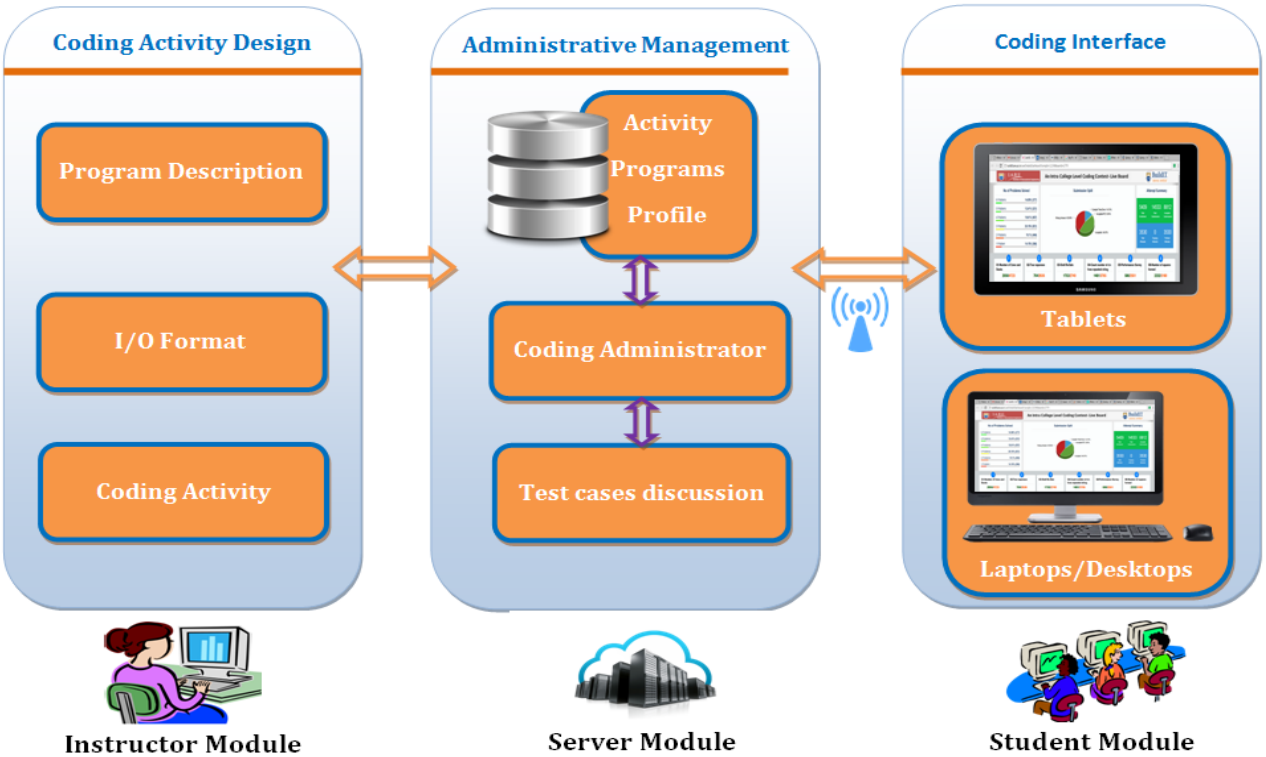


Figure 2. BuildIT - online coding platform framework

b. ***Administrator Module*:** This module is administrator end module. Here, the administrator is responsible for maintaining the database and updating the applications based on faculty and students needs. The administrator should solve the issues of faculty/students during the exam. He can add/remove a new instructor or student to/from the database respectively.

c. ***Student Module*:** This module is student end module. Here, the students can take coding test according to the schedules given by faculty members. The students can attempt coding test from anywhere with the availability of internet facility. They can take the test using their laptops/ tablets. Their test submission is successful if they match their output with instructor output otherwise it is treated as wrong

submission even though the program produces correct results. Because here the evaluator is a machine, so you don't have provision to explain your problem.

Implementation

Figure 3 shows the home page of BuildIT platform. Here, we can display all information regarding the contest like Contest date, registration starting and ending timings, venue and prizes. In every contest we have given six programs and 4 hours time The students can register for this contest using registration page by entering personal details like roll number, date of birth and mobile number. Here, we have given one constraint to registration i.e., it allows only those students to register whose roll numbers matches with the date of births of college database. This can avoid registration from unauthorized users. Figure 4 shows the login page. The students can login into contest using their roll number and web access key, and they can start their contest.

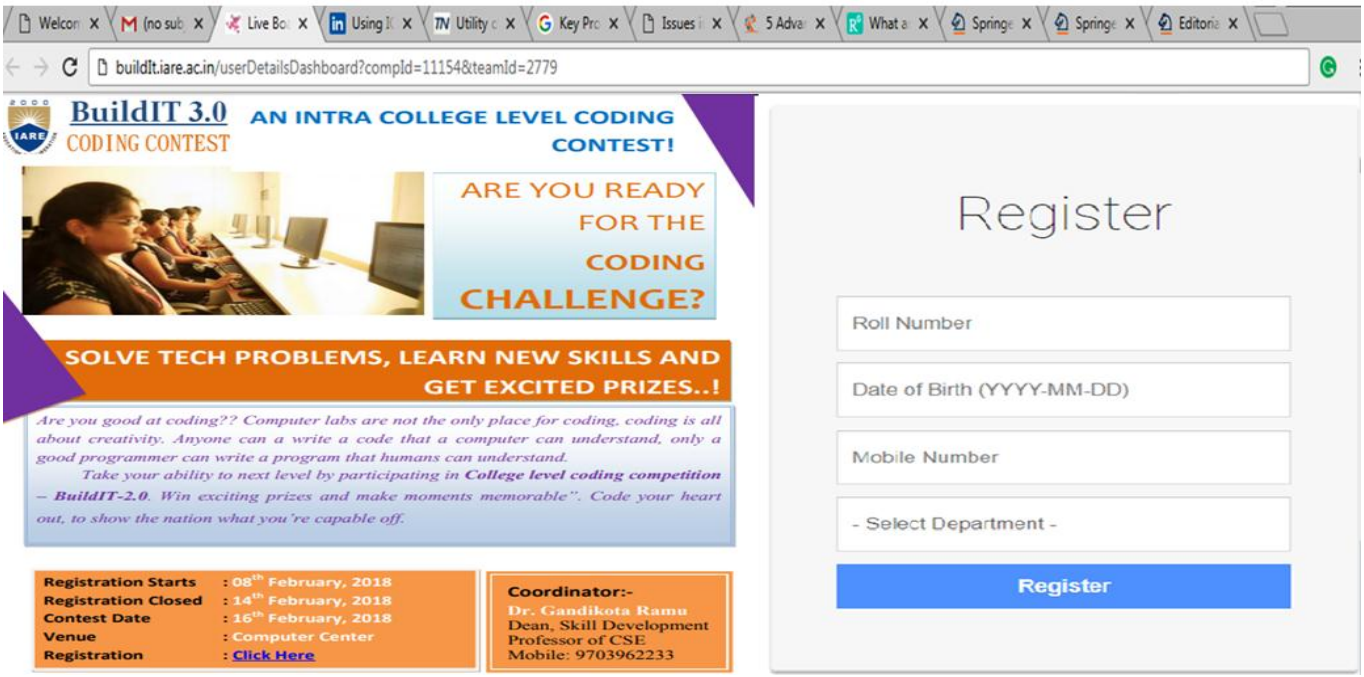


Figure 3. BuildIT home and registration page

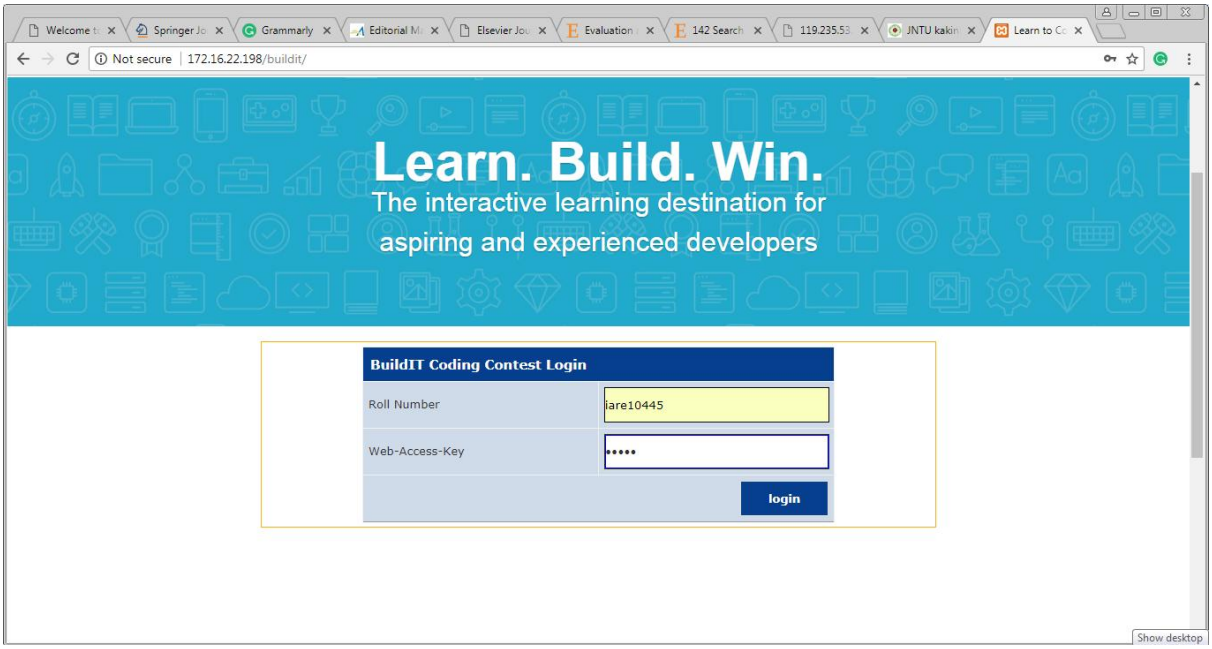


Figure 4. BuildIT login page

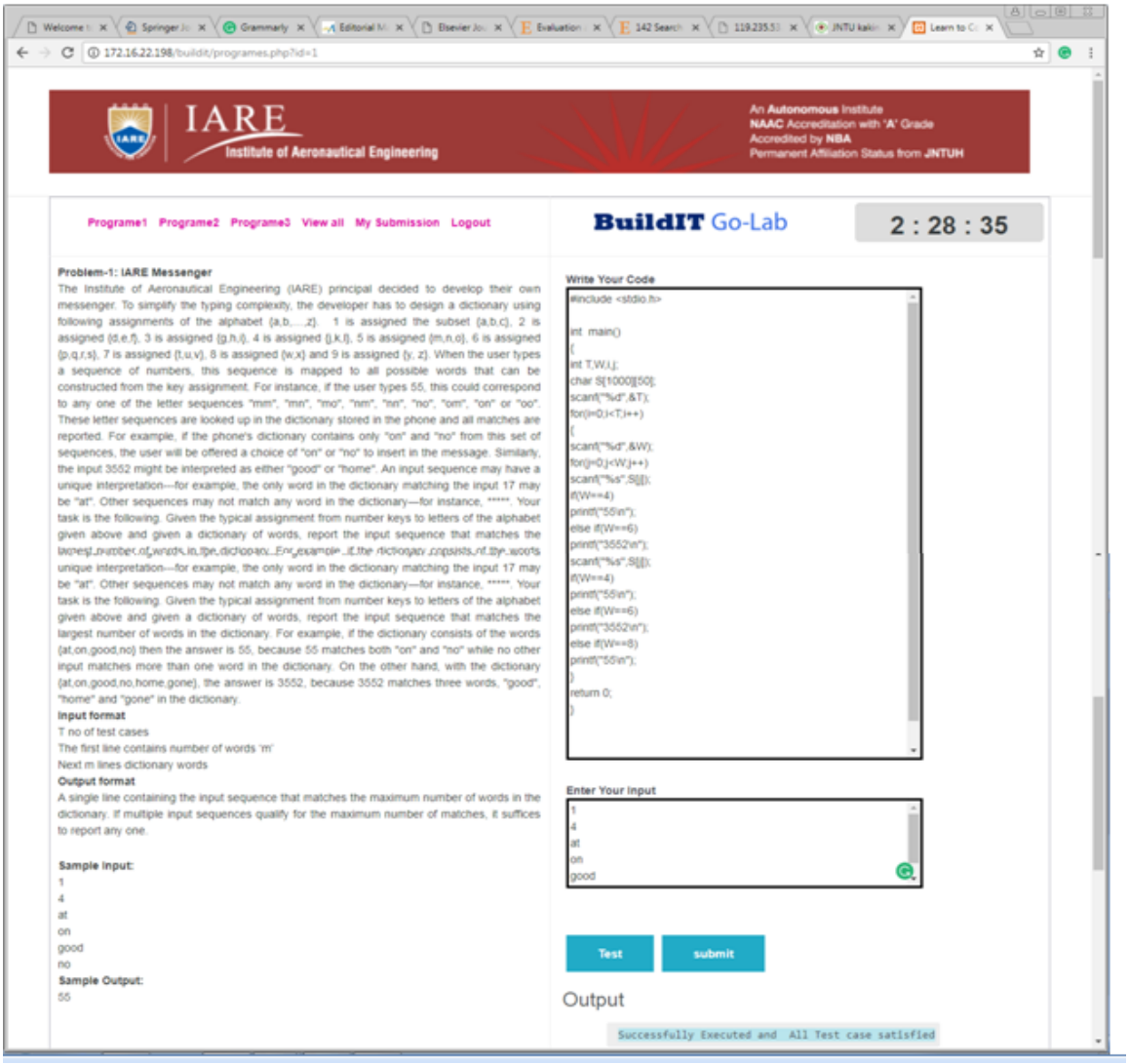


Figure 5. BuildIT coding page

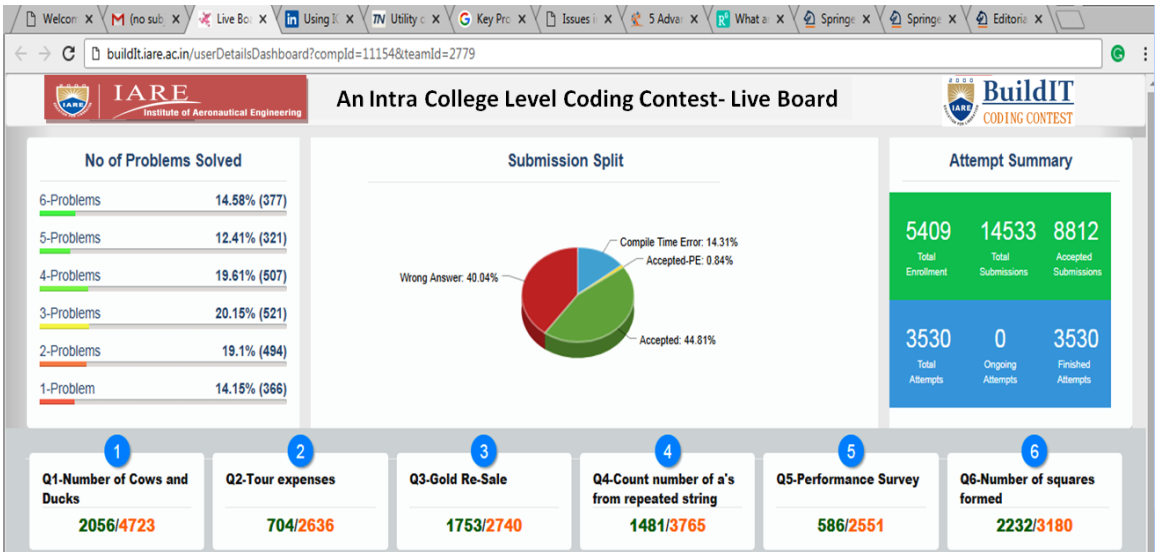


Figure 6. BuildIT live board – for easy analysis of student's performance

After login, the students can enter into coding contest page as shown in figure5. The students can start to write the code for the program either in BuildIT platform or they may use any one of the IDE (Integrated Development Environment) to write the code and can place their code in BuildIT editor. The students should solve all programs within the stipulated time as shown in right side top. They may check the status of each program on My Submission tab. If they want to see overall contest status, then they can check Live Board as shown in figure 6. The students ranks are announced after completion of the contest. If there is any tie between two participants, they will consider submission time and number of submissions. The Live Board is very helpful to the instructor to analyze the participants level and to take measures.

RESULTS AND ANALYSIS

Table 1. One year BuildIT coding contest information regarding number of students registered, participated and number of problems solved

	Registered	Participated	1 problem	2 problems	3 problems	4 problems	5 problems	6 problems
Jan-17	500	225	8	11	11	11	7	8
Feb-17	1002	501	20	27	29	28	18	21
Mar-17	1389	803	38	51	54	52	33	39
Apr-17	1678	881	45	60	63	62	39	46
May-17	1221	650	38	52	55	53	34	39
Jun-17	2313	1002	68	91	96	94	59	70
Jul-17	3443	2205	164	222	234	228	144	169
Aug-17	3343	2121	167	225	237	231	146	172
Sep-17	3988	2102	186	251	265	258	163	192
Oct-17	4424	3011	355	479	506	492	311	366
Nov-17	2233	1232	158	214	226	220	139	163
Dec-17	5409	3530	499	674	711	692	438	515

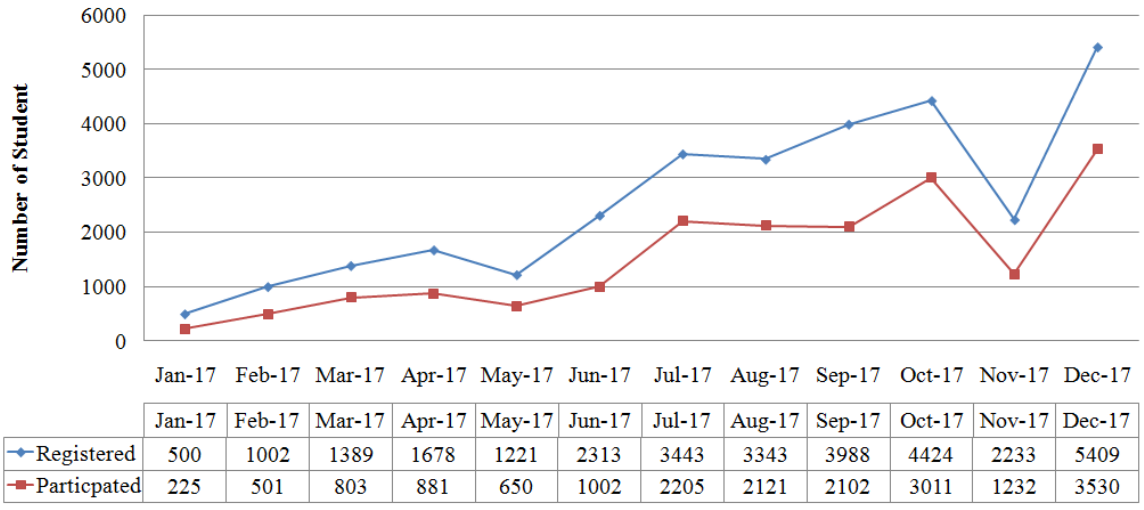
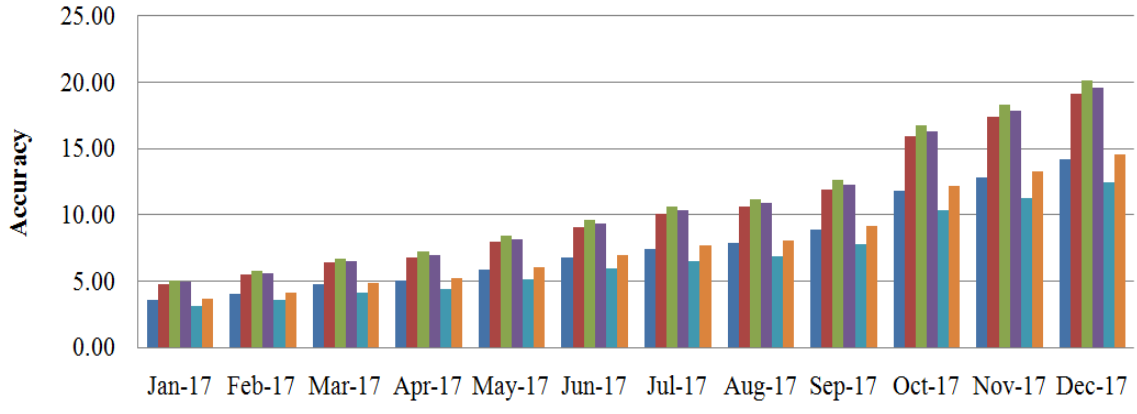


Figure 7. Students gets motivated to register and participate for the last one year

In IARE College we had run this application since one year and results are as shown in table 1**.** Initially, few members were shown interest to register and participate in this contest. We motivated students in various ways like announcing cash prizes of top three rankers, giving awareness regarding coding importance in placements and many more to improve the interest of students to participate in online coding and BuildIT. Finally, we succeed by achieving a good number of students registered and participated. The figure 7 shows the number of students registered and participated for the last one year. If we observe the graph we can understand the growth of the contest. Initially, only 500 members were registered and only 225 members were participated i.e., below half of the registered candidates. But in the month of December, 5409 students were registered and 3530 students were participated, which is more than 65%. Due to semester exams in the month of May and November, the number of registered students count is decreased.



	Jan-17	Feb-17	Mar-17	Apr-17	May-17	Jun-17	Jul-17	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17
1-problem	3.54	4.04	4.72	5.05	5.90	6.74	7.45	7.86	8.84	11.79	12.86	14.15
2-problems	4.78	5.46	6.37	6.82	7.96	9.10	10.05	10.61	11.94	15.92	17.36	19.10
3-problems	5.04	5.76	6.72	7.20	8.40	9.60	10.61	11.19	12.59	16.79	18.32	20.15
4-problems	4.90	5.60	6.54	7.00	8.17	9.34	10.32	10.89	12.26	16.34	17.83	19.61
5-problems	3.10	3.55	4.14	4.43	5.17	5.91	6.53	6.89	7.76	10.34	11.28	12.41
6-problems	3.65	4.17	4.86	5.21	6.08	6.94	7.67	8.10	9.11	12.15	13.25	14.58

Figure 8. Students performance in last year : number of problems solved versus number of students participated

The students performance is increased on monthly basis is shown in figure 8. Initially, the number of students solved one, two, three, four, five and six problems are 8, 11, 11, 11, 7, 8 respectively. It compares with number of participants; the ratio is just 3.54, 4.78, 5.04, 4.90, 3.10 and 3.65 with respectively number of problems solved students. Then we have conducted some training classes to improve the students performance. Finally, the number of students solved one, two, three, four, five and six are 499, 674, 711, 692, 438, 515 respectively. It compares with number of participants; the ratio is 14.15, 19.10, 20.15, 19.61, 12.41 and 14.58 with respectively number of problems solved students. These results show that the performance is increased 5 times better when compared to initial conditions.

CONCLUSION

The BuildIT- online coding approach experimentation is conducted in 12 months, the result analysis insisted that with the effectiveness of the BuildIT, the coding skills and analyzation skills of IARE students are improved to solve a new problem statement. Most of the findings are accorded with those of previous studies. Accordingly, this paper suggests some decisive recommendations for improving coding skills in Indian Engineering students. But, this research had some limitations like it has considered only one college students experimental results which are inadequate to outside stimulation. In future, we can address these mentioned issues and furthermore, we can work towards to predict coding skills based on their 10+2 results and some parameters in Indian contest.

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