

# **BLENDED POGIL AND DEVELOPER BLOG LEARNING FOR SENIOR PROJECT IMPLEMENTATION**

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## **ABSTRACT**

The senior project phase in the Engineering curriculum is a crucial one for the students as it makes them practicing engineers which pave their way to industry. This transformation phase which translates their theoretical knowledge to practicing knowledge is quite challenging in today's rapid-paced development environment., Students prefer to choose the one which is easy for them as they have been trained to get grades in the lockstep progress system. Many fears choosing an embedded field and teachers too prefer MATLAB-oriented projects or research either due to a lack of knowledge or for the fear of completing the project on time. It is really a worrying fact. This paper discusses the use of POGIL classes along with the directed use of developer blogs for overcoming such fear and completing the project with confidence and competency. Accordingly, students were motivated and trained/scaffolded to use the developer blogs. The key outcome observed was that, on regular usage of the developer blogs, students' interest in doing embedded projects and their confidence in completing the same has increased.

## **KEYWORDS**

Blog, POGIL, embedded, Standards 2,5,6,7,8

## **INTRODUCTION**

Active learning plays a key role in upgrading the teaching and learning system in educational centres. Nowadays, most universities considered Active Learning Methodology (ALM) as one of the effective methods for educating students. It involves well-planned learning, participative learning, and the use of information and communication technology. Besides, nowadays child's education is not only limited to the classrooms as there are other means of making and sharing their thoughts outside of the class (Rowse & Walsh, 2011) . In the modern world, students are well aware of the technologies and use them for collecting information and generating end results. Therefore, the job of the teachers is vital, they need to understand the evolution of the nature of education and upgrade it.

The blog is one such platform where an individual, or a number of people, is able to easily upload text, photo, video and other multimedia content, and share it with an unlimited amount of internet users (Deng, Liping and Yuen, 2011) (Lang, 2005). Concurrently, it can be used as a learning methodology, which utilizes the student's awareness about the technologies and

their usage. Hence recently academicians started using it for active learning. Also, it is different from the webpage that, it can be created easily and an invitation to the other authors to the blogs is possible (Nedeva & Nedev, 2010) which facilitates cooperative learning. Hence, it can be considered mainly as a learning tool in education (Hall & Davison, 2007) rather than content providing platform. Integrating blogging can also be considered as a powerful tool in determining the learners' Information and Communication Technology perception (Goktas & Demirel, 2012).

Most of the studies reported on the usage of the blog in language teaching or on the creation of blogs within the Institution and make use of it. In addition to this, it is demonstrated that it can be used to improve the reflective thinking of the person over a time period, with the help of the blog's history (Ellison, Nicole and Wu, 2008). Another study has demonstrated an improvement in confidence and learning ownership by incorporating blogging into student-centric methods. The student who was disgusted with open discussion found this platform a friendly one and felt free to participate in the discussion even. Also, it gives a platform to the student whose second language is English to improve their writing skills. A closed blog is considered more useful in making the activity successful due to the confidence it creates if the blog contents receive a higher vote. The study done by (La Caze, 2017) demonstrated an improvement in the quality of writing as extra care has been taken by students in writing because of viewability by others. and it also has been used as a platform for sharing their experiences by some students. The study done by (Aydin, 2014) also supports the above statement i.e. more engagement of students using blogging in class which, improved their reading and writing skills. (Alsamadani, 2017) has demonstrated that, in addition to writing skills, blogging improves, the choice of words and language. Another study discovered the usefulness of blogging in improving the grade point (Pursel & Xie, 2020).

The authors (Shana & Abulibdehb, 2015) have used the platforms such as Blogger, Daftaree and Posterous for blog creation. They reported in their finding that it increased students' critical thinking skills apart from a medium to discuss, share ideas and do homework. (Ebrecht & Ku, 2014) highlighted that blogging promotes meaningful communication and develops critical and analytical thinking, along with collaborative and brooding skills. (O'Byrne, Barbara and Murrell, 2014) stated that blogging helps students to create meaning and participate in meaningful dialogue within and beyond the classroom.

Several studies have also been done to understand the reflections from the perspective of teachers. (Knight, 2009) have done a study to collect reflections about blog learning from a tutor's perspective, they found that, it helps in unifying diverse students, minimal time is spent in checking the understanding level of the student, eases the identification of the difficulties of individual students, eases keeping of records. In another study done at Turkey University with 174 pre-service teachers, teachers agreed on the usefulness of blogging in improving critical thinking (Ocak et al., 2020) and other users of blogs as a teacher, like a vast amount of information on a particular topic. (Kiliç & Gökdaş, 2014) conducted a study with 75 pre-service teachers, which includes the beginner, intermediate and expert groups. The assessment of the teacher was done by allotting, a major grade to the instructional design model in the blog and their comments on others' posts and the remaining grade was to the comments they received. The analysis proved the usage of blogs in the enhancement of overall learning, knowledge sharing, and experiences using blogs.

The investigation made by (Liu, 2016) with a different kind of blog proved that the speech proficiency of the participating student has increased tremendously and it is achieved by blending a class video blog. This shows that class video blogs also can be considered for the

blending learning purpose. (Tang & Lam, 2014) have proved in their study that low achievers also are benefitted from blog learning. The two main points that contribute to the effectiveness of blogs in enhancing learning include active participation and interactions among the students. (Yang et al., 2016) have done a study to find the relationship between online presence and course performance. It showed a remarkable impact on the learning process. Moreover, it significantly improves the participant's subjective and learning outcomes

Qualitative data collected by (Ellison, Nicole and Wu, 2008) revealed that, reviewing and critiquing the work of peers need more guidance. (Garcia et al., 2019) demonstrated the need for instructors to identify students' expectations and planned accordingly. Moreover, it also suggested the need for the awareness of students' perceptions and past experiences since poor past experiences can have a negative impact on engagement (Garcia et al., 2019) Though the kind of learning provided by blogs is derivatively authentic, it is driven by individual interests and connected to classroom realities. Most of the studies discussed above conclude improvement of writing or reading skills with statistical data. However, for critical thinking, it is only the learner's feedback that is not a concrete measure. Even to comment on others' work, the learners need guidance. Process Oriented Guided Inquiry Learning (POGIL) is another kind of active learning (Banu et al., 2020), where group of students work together assuming different roles for each. Here the teacher assumes the role of facilitator and guides the students, so that they acquire complex problem-solving skills. Hence this paper addresses the issue with the blog learning by blending POGIL classes with using developer blogs.

### **Research Question**

We live in a period with an accelerating change of technology where it is a very challenging task for academic institutions to get updated with the current technology. Hence apart from creating an academicians' own blog, it is very much essential to investigate other blogs, especially the industry blog in the field of embedded domain. In embedded development, having the right tools for the job is critical to success. But in the hands of the inadequately skilled, even the right tools can yield a disastrous outcome. Today's busy environment in universities is not amicable for instructors to explore new products in the embedded market immediately after the release. Hence the natural tendency is to Google, so the research questions are.

- Is googling enough? What are the key factors, which assist learners to use EVM blogs for their project completion?
- How EVM blogs motivate the learners?

Googling alone cannot help as the problems they encounter are not theoretical problems. Hence this paper addresses this issue with blended POGIL external blog learning.

### **METHODOLOGY**

A total of 5 project teams were considered for the study. Each team was formed with four to five members. The project team size is chosen because, they will be conversational, and it leads to varying perspectives of their discussion. The projects given to the teams were some simple implementation projects but on ARM core3 processors. Two teams were average performers, the other two were above average and the rest is underperformers. All the students were new to the toolchain used for ARM processors, not only that they did not have confidence in using any of such tools. The study employed a controlled design, in which the control group i.e., above-average group (2 project groups) was left with no guidance to refer

to the blogs and the experimental groups (3) were guided in (Blended POGIL-DBL) for each issue they encountered while implementing the project. Throughout the project, students were given continuous scaffolding to use the appropriate referred blog sites by the Evaluation Board Manufacturers (EVM). The scaffolding given was primarily in terms of recap questions from their earlier courses which were related to their project. The entire scaffolding stages followed were as given below

- Collecting the project requirement and necessary data sheets for the project
- Making draft design
- Identification of similar working modules from social media especially from the manufacturer's website
- Referring EVM manufacturers blog for any compilation issue or incompatible s/w or h/w module issue
- Unit testing of each module followed by integrating more than one module
- Preparing Testing and validation procedure
- Prepare all project documentation.
- Prepare a final oral presentation.

Good thing is that developers using specific products of companies share their knowledge and difficulties faced in blogs. Hence the team was instructed to use blogs for the below-listed common issues encountered during the project initial phase.

- Board or debugger compatibility issues with the given operating system version,
- Tool setting problem including RAM/Flash address change.
- Usage of hardware code snippets

Contrary to the results in the usage of blogs in learning language, the students encountered difficulties in understanding the blogs. This is because they had an unclear understanding of microprocessors and microcontroller courses; in addition, they had to work on higher-end processors like ARM for their project. Here the POGIL classes for each of the blogs by the instructor helped the learners. The sense of ownership students received was more overwhelming than they felt with POGIL classes in their previous semesters.

## **CDIO CONNECTION**

The CDIO framework used was Conceive Design-Implement cycle. Blended POGIL\_DBL learning easily addresses Standard 5 (Design experience) the design, implement experience as the activity chosen itself is senior phase project implementation. Students got a rich project experience in terms of workplace experience by referring to EVM and with the guidance by the teachers. It also addresses Standard 6 (Engineering workspace) by giving them a learning environment where they can easily get all the resources, they require including WIFI and computers. By closely working with their partners students acquired interpersonal skills and project management skills by dividing the modules responsibility among themselves. Hence it naturally addressed the Standard 7 (Integrated learning experience). The project phase is not teacher led directly, only scaffolding and hence Standard 8 (Active Learning) i.e., students were active and not passive. In addition to the above standards, which were achieved seamlessly, learning objectives were chosen carefully to achieve success in this research via Standard 2 and is listed in the table 1 below. The learning objectives were framed with respect to the blogs as the purpose of the research is to use the developer blogs for project success

i.e., addressing research question 1. Students were trained to write blog appropriate questions by using their critical thinking skills. While referring the developer blogs, they may get more than one solution. Choosing the appropriate questions for their problem in hand requires more system thinking. By referring to more and more questions depending on their problems, they started exhibiting self-learning without discussing with their teachers, a powerful and visible learning outcome.

Table 1. Standard 2 Learning outcomes

| S.No | Learning Outcome   | CDIO Standard           |
|------|--|-------------------------|
| 1    | Demonstrate the ability to write the appropriate blog questions to get the answer to their problem | 2.4.4 critical thinking |
| 2    | Demonstrate the ability to get the solution from EVM blogs   | 2.3.1 systems thinking  |
| 3    | Demonstrate the ability of self-learning   | 2.4.6                   |
| 4    | Demonstrate the ability to communicate embedded domain jargons with their team members             | 2.4.6                   |

## RESULTS AND DISCUSSION

Statistical analysis has been carried out to analyse the impact of the Blended POGIL-DBL learning on students. They were asked to participate in the survey and thereby evaluated their awareness, attitude and outcome related to a 5-point response scale. The list of questions used are listed in table 2. It also has one statement answer question. The survey results from the figure 1 for the question, “Are you confident enough for workplace setting”, reveals that the experimental group on average gave a better performance than the control group students. Control group students are originally above average performers, still they are not confident enough due to not enough guidance and hence answered neutral. Though the experimental group feedback for the project understanding is less comparatively to control group as in figure 2, their feedback on readiness for industry is 80 % whereas in control group it is only 64%. It is found that it is attributed to experimental group’s jump in understanding the developer blog with the help of POGIL compared to their level before the new pedagogy. POGIL-DBL paved the way for even the average and low performers to understand project implementation without much difficulty (90 % considering exceptional and good enough rating together).

Table 2. Feedback questions

| S.No | Feedback questions with Likert scale  |
|------|---|
| 1    | Are you confident of meeting industry needs after you have completed your project?          |
| 2    | What extent the blended POGIL-DBL gave an improved project understanding for implementation |
| 3    | what extent this learning built your strength or corrected your deficiencies                |

|             |  |
|-------------|--|
| 4           | Have you started doing own thinking for solving the technical issues |
| <b>S.No</b> | <b>Feedback question with self-written statement</b>                 |
| 1           | What motivated you to refer the blogs without hesitation?            |

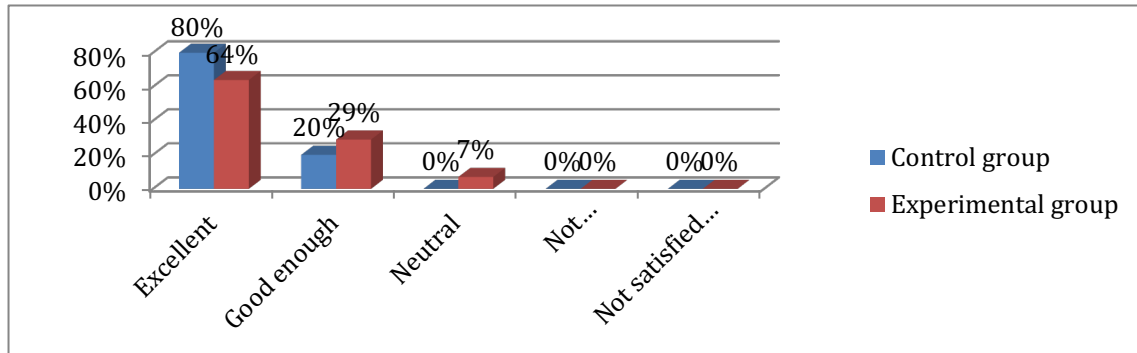


Figure 1. Response chart for the question “Are you confident of meeting industry needs after you have completed your project?”

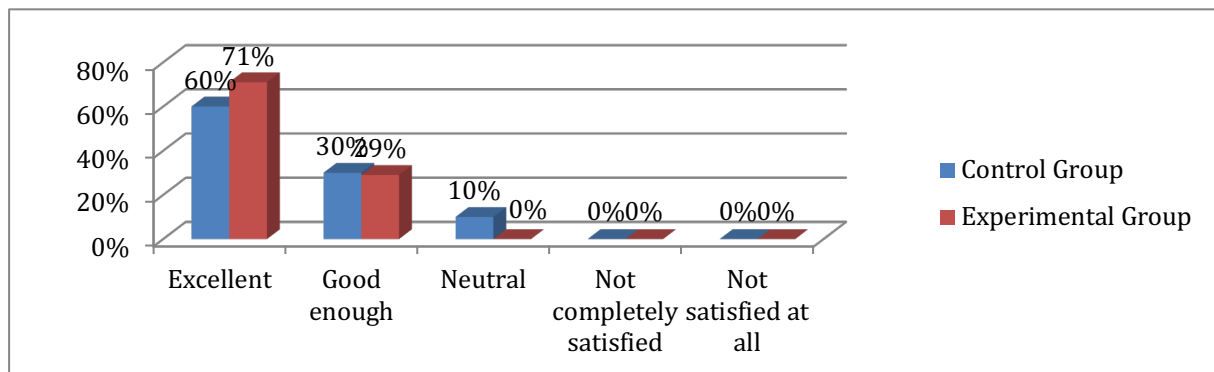


Figure 2. Response chart for the question “What extent the blended POGIL-DBL gave an improved project understanding for implementation?”

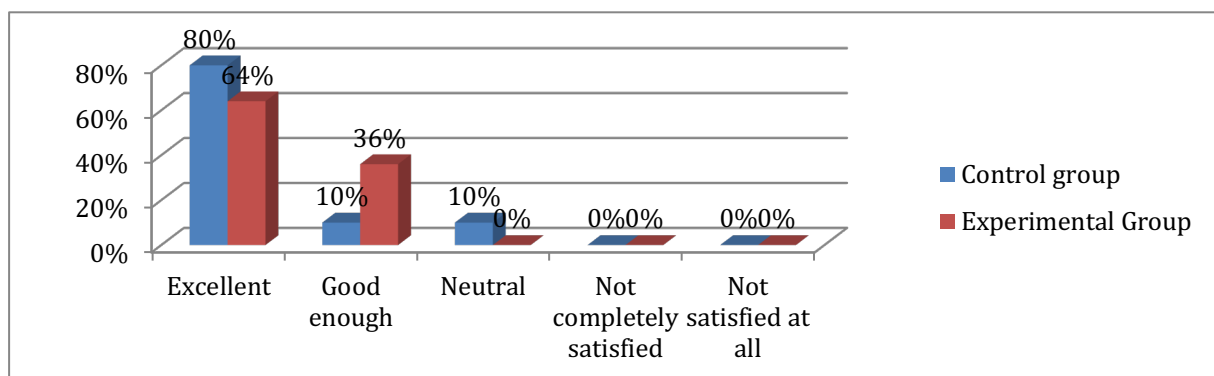


Figure 3. Response chart for the question what extent this learning built your strength or corrected your deficiencies?

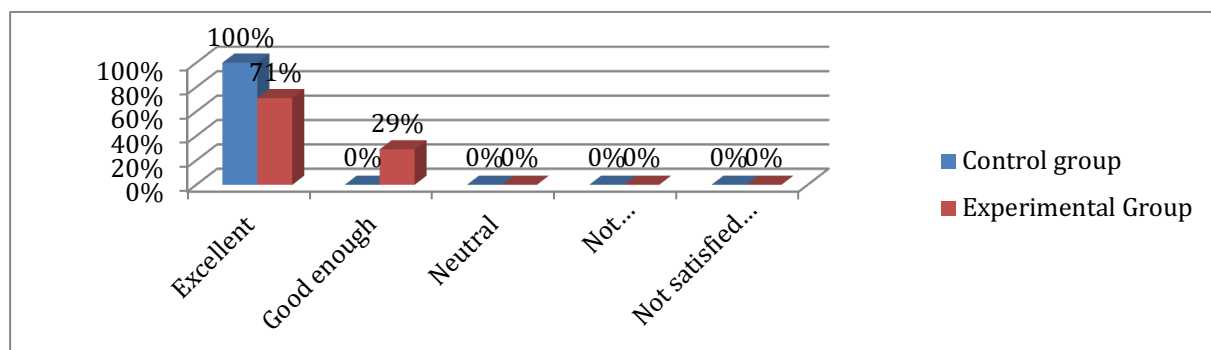


Figure 4. Response chart for the question Have you started doing own thinking for solving the technical issues?

From figure 3, it can be inferred that, all the experimental group students have benefitted from this exercise, whereas still 10% students from the control group are in confusion that, if they are really benefitted or not. Figure 4 shows, POGIL\_DBL/DBL made the experimental/control group to think critically. Overall, it can be concluded that, the role of DBL is appreciative and POGIL\_DBL is still more appreciative for all kind of learners. This answers the research question 1 that, googling is not enough i.e., if there are no guidance students cannot filter out the gold from the sand. The answer for the question, “what motivated them to refer DBL” (research question 2) is invariably the same from all the learners that, they were happy to know worldwide all embedded engineers undergo the same problems and hence they are not alone, and it is part and parcel of the embedded engineers’ career.

## CONCLUSION

In summary, blended POGIL\_DBL helped the learners to connect their learning in the earlier semester to a project which was very vague once. The fear about doing embedded projects went off when they learned that practical issues are common to everyone. The sense of ownership students received was so overwhelming than they felt with POGIL classes in their previous semesters. The confidence to face workplace challenges increased exponentially. The average learner group who got the guidance performed similarly and sometimes exceeded the expectation, and the reason behind this is that the POGIL classes by the instructor, for each of the developer blogs, helped the learners.

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**N. M. Masoodhu Banu, Ph.D.**, graduated from Thiagarajar College of Engineering Madurai, obtained her M.E from Guindy College of Engineering Chennai and doctorate from Anna University Chennai. She has worked in Indian Space Research Organization Bangalore, India from 1999 to 2000 and in Motorola India Electronics Ltd Bangalore from 2000 to 2008. During her tenure in Motorola, she has worked on audio and video codecs implementation on Texas processor and also on various real time operating systems, based system implementation, where all these algorithms went into various versions of Motorola mobile. Being an Industry person, knows the gap between Engineering Education standard and Industry requirement. Hence currently she has started focusing her scholarly activities on innovative pedagogy and curriculum development. She is a creative thinker in designing instructional methodology to suit the current generation student's needs. A highly passionate, hardworking teacher who wants to teach the students in multiple dimensions. Hence a lifelong learner who keeps updating with current technology and follow this to the core. She believes in the research which goes hand in hand with academics. Her research interest spans across Embedded signal processing, Artificial intelligence and neural networks in addition to pedagogy.

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