Industry and research: in situ-based learning for engineering education

Gabriel Luna-Sandoval[1], Eusebio Jiménez-López[2], Martín Santacruz-Tirado[3], Víctor Hugo Yaurima-Basaldúa[4], Marco A. Maciel-Monteon[5] and Raquel Cibrian-Valle[6]

[1] Universidad Estatal de Sonora, San Luis R.C., México, gabriel.luna@ues.mx
[2] Universidad La Salle Noroeste – CINNTRA de la UTS-IIMM, Cd. Obregón., México, ejimenezl@msn.com
[3] Universidad Estatal de Sonora, San Luis R.C., México, msantacruztir@hotmail.com
[4] Universidad Estatal de Sonora, San Luis R.C., México, victor.yaurima@ues.mx
[5] Universidad Estatal de Sonora, San Luis R.C., México, macielmonteon@hotmail.com
[6] Universidad Tecnológica de Puerto Peñasco, Puerto Peñasco., México, raquelcibrian@hotmail.com

Abstract

Teaching methodologies in engineering have always different challenges and problems to be taught in universities, are designed to offer the student pedagogical alternatives convincing and easily understood for better professional preparation. In the world, many teaching methods at universities have motivated the student in the engineering learning, other universities have delayed trying to imitate their peers without the elementary and needed resources to successfully teaching. Studying other iNEER conferences in previous years and adding own experiences of engineering teaching at Sonora State University, a new proposal In Situ-Based Learning (BLis) is presented. The BLis can consider two main alternatives for engineering education: Industry-Based Learning (BLind) and Research-Based Learning (BLres). Both based on education competency which encourage collaborative work, creativity and self-teaching. The BLind is been used in some universities in the world and is relatively new, but with considerable results in teaching and learning experiences for students. The BLres is a new approach to the student teaching and learning, focused on research laboratories from same educational institutes where studies, or in industry laboratories where is existing an academic partnering. With the intention that the student be evaluated in situ (BLis) for his temporal academic supervisor (BLind or BLres), this evaluation will be sent to the professor of the subject which should be involved in student activities, and most important the student will be involved in research and industry activities before graduate.

Keywords: *Industry-Based Learning, Research-Based Learning, Engineering Education*.

Index terms

BLis	In Situ-Based Learning
BLind	Industry-Based Learning
BLres	Research Based-Learning
iNEER	International Network on Engineering Education & Research

1. Introduction

Through time teaching education has varied with different methodologies, teaching engineering is no exception, the contrary, it is one of the branches of education with a distinctive approach to student and teacher learn and teach respectively in a more didactic manner.

iNEER has been commissioned to bring this information to the world, taking into account several of your articles in order to submit a new proposal for teaching engineering arguments results obtained with methodologies used in teaching both proposals were considered as not had been implemented .

Many of these proposals and methodologies have a resemblance to the new proposal, the premise rests with the student along with their teacher to engage in research activities and/or processes in industry or at the same university for a grade at the end of the subject. Given that it should include a third, this will be the person responsible for the student in industry (Industry-Based Learning) or research laboratory (Research-Based Learning) where you perform the In Situ-Based Learning.

Thus, the student applies the knowledge acquired in the course (the teacher) with the academic supervisor temporary site , obtaining student performance according to your score at the end of the academic year . For this purpose, the school should be a prior linking with industry or research laboratory. Also meeting the objective or bylaws to encourage the whole productive sector institutions to work or vice versa.

1.1. BLis

BLis encourage students to think critically, creatively, and collaboratively, develop global competencies, access the knowledge in the disciplines, develop effective oral and written communication skills, apply their learning by designing products and performances, assess their own learning, develop as a self-directed, independent and interdependent learner, and integrate technology meaningfully.

These point involves students in design, problem-solving, decision making, or investigative activities; give students the opportunity to work relatively autonomously over extended periods of time; and culminate in realistic products or presentations. The results of the student learning experience can be used as part of several degree alternatives, such as experience, thesis or project.

2. BLis Context

BLis is a propose teaching method in which students gain knowledge and skills by working for an extended period of time to investigate and respond to a complex question, problem, or challenge. Essential Elements of BLis include Significant Content, 21st century competencies, In-Depth Inquiry, Driving Question, Need to Know, Voice and Choice, Revision and Reflection, Public Audience, In situ Evaluation and, Graduate alternatives processes.

In Blis, learning is contextual, creative, and shared. Students collaborate on meaningful projects that require critical thinking, creativity, and communication in order for them to answer challenging questions or solve complex problems. By making learning relevant to them in this way, students see a purpose for mastering state-required skills and content concepts and a graduate alternative.

Students aren't just assessed on their understanding of academic content, but on their ability to successfully apply that content when solving authentic problems. Through this process, BLis gives students the opportunity to develop the real life skills required for success in today's world.

3. Methodology

BLis is a model that organizes learning around industrial or research projects that involve students in design, problem-solving, decision making, or investigative activities; give students the opportunity to work relatively autonomously over extended periods of time; and culminate in realistic products or presentations.

Designed properly, BLis will may lead to an increased motivation that can have a positive effect on learning. This applies in particular to projects that have a practical relevance and that students can identify as their project.

Working on a tangible product that takes shape yields feelings of success which in turn boosts motivation. Projects engage learners to connect knowledge, including prior knowledge. Therefore projects are important component of constructivist approaches. Also projects engage learners to work with other people, including teachers and partners from practice.

BLis can be applied in two principal techniques, BLind and BLres shows in Table 1 and Table 2 respectively.

Table 1. BLind stages for BLis.

Stage	Action
Preparation	Teacher explicitly identifies and conveys pedagogic intentions (students should know what they will learn from it) Choice of the project Planning
Implementation	Industry project
Evaluation	Temporal academic supervisor
Presentation / Diffusion	Thesis, project, subject

Table 2. BLres stages for BLis.

Stage	Action
Preparation	Teacher explicitly identifies and conveys pedagogic intentions (students should know what they will learn from it) Choice of the project theme Planning
Research design or analysis of the initial problem	Initial literature review. Research goals and research questions. Research and Development methodology. Presentation, Evaluation and Revision of these.
Evaluation	Temporal academic supervisor
Presentation / Diffusion	Thesis, project, subject

4. Conclusion and discussion

This paper presents a proposal of implementing BLis in engineering education. The main conclusions from this work are summarized below:

With BLres the students were able to participate in a project that involved the research and development. The proposal required teamwork, systematic information search, critical analysis of various proposals and constant testing technologies in situ.

The BLind was accepted satisfactorily by students in most of the universities which are applied, it allowed them to develop an industrial project requiring effective planning, integration of various disciplines of knowledge, consultation with experts and need to implement theoretical knowledge. The development of the industrial or research project gives an interaction between students and company representatives, and between students and teachers who participate as technical advisors.

This interaction contributed to the flow of information and experiences that enriched the knowledge of the students the teacher and the temporal academic supervisor. The BLis could contribute greatly to improve the processes of teaching and learning, and that promote creativity, critical thinking, management of complex situations, encourage research and collaborative work which helps them to identify their social skills and group and self-organization and self-learning are also demanding that the professor makes an effective project planning.

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Authors

Principal Author: Gabriel Luna-Sandoval received a bachelor's degree in Mechanical Engineering from the "Universidad Autónoma de Baja California" in 1997. Received the Master degree in Science in Mechatronics Engineering from "Instituto Tecnológico Superior de Cajeme" in 2008, and in 2013 received the Ph.D. degree in Science in Mechanical Engineering at the "Instituto Politécnico Nacional" in México City. Currently he is a research professor and teaches at "Universidad Estatal de Sonora" in México...

Co-author: Eusebio Jiménez-López received a bachelor's degree in Industrial Mechanical Engineering from "Instituto Tecnológico de Saltillo" in 1994. Received the Master degree in Mechanical Engineering at "Universidad Nacional Autónoma de México" in 1998 and with a Ph.D degree in Mechanical Engineering at UNAM in 2013. Currently, he is a professor at "Universidad Tecnológica de Sonora" and at "La Salle Norwest University", currently he is CEO of SPIN-OFF Innovation Company in Manufacturing Engineering and Maintenance S of RL MI.

Co-author: Martín Santacruz-Tirado in 1996 obtain industrial engineer title, in 2001 enters the academy by theaching several engineering asignatures in the "State University of Sonora" in México, in 2006 obtain the Master degree on Control and Automation, and since 2011 is studying to achieve his Doctoral Degree at "University of Baja California" in Mexicali México.

Co-author: Victor Hugo Yaurima-Basaldúa received a bachelor's degree in Computer System Engineering at Acapulco technological Institute in 1992. Received the Master degree in Business Administration at Montemorelos University in 1998, and in 2008 received the Ph.D. degree in Computer Science at Autonomous University of Baja California. Currently he is a research professor at Sonora State University in México.

Co-author: Marco Antonio Maciel-Monteón received a bachelor's degree in Industrial Engineering at "Centro de Enseñanza Técnica y superior" in 1985. Received the Master degree in Science in Optimization of Industrial Systems at "Centro de Enseñanza Técnica y Superior" in 2003 . Currently he is a research professor at "Universidad Estatal de Sonora" in México.

Co-author: Raquel Cibrián Valle holds a Master degree in Educational Administration from the Posgrade Pedagogic Institute of Sonora. Currently studies a PhD in Teaching English at the University of Southampton in U.K. She is presently an English Teacher at Puerto Peñasco Technological University in México.