

Motivating Students Using Project Based Learning (PjBL) via e-SOLMS Technology

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Abstract: This paper focuses on PjBL concept via online learning instrument, Student Oriented Learning Management System (e-SOLMS). The PjBL module is supported with “online” web-based system called e-SOLMS. This system has been pilot tested on Mechanical Engineering students at Kota Bharu Polytechnic, Kelantan, Malaysia. It is hoped that this PjBL: eSOLMS becomes as alternative of new online learning resource for technical and vocational education in Malaysia. This system enables continuous monitoring of the students’ project development progress by lecturers or supervisors and parents. This study finds that engineering students who are attached with PjBL:eSOLMS demonstrate increases in their intrinsic orientation.

Key words: Project Based Learning (PjBL) • Student Oriented Learning Management System (e-SOLMS)
• Motivation

INTRODUCTION

This article focuses on PjBL concept via online learning instrument called e-SOLMS that was pilot tested to develop motivation in students engaged in producing innovative products at Mechanical Engineering Department, Kota Bharu Polytechnic, Kelantan, Malaysia. Based on constructivism theory, the PjBL module which provides new alternative Project based-learning module for the 21st century was developed by U.S.M PhD candidate, Mr. Md. Baharuddin. An online instrument (e-SOLMS) was developed by USM PhD candidate, Mr Khairul Azhar, parallel to the module to provide online Project Based Learning at international standards. This new online PjBL learning facilitates continuous collaborative learning among students and supervisors.

With strength and advantages comparable to other PjBL models, this PjBL:eSOLMS has become a new alternative learning instrument for producing innovative product and providing high technical manpower support to the local and international industry needs. The high level of students’ motivation produced by this instrument will help achieve the government aim to generate high

skilled empowerment. The PjBL:eSOLMS works as a self directed learning (SDL) for students who are attached with project development. This new alternative learning instrument will match the competencies required in the industry. Polytechnic students will be able to explore and use this PjBL:eSOLMS systems [1]. This alternative online learning helps develop students’ self management, generate internal and external motivation to solve problems, generate cognitive development via process running and its attachment with advance technology [2].

PjBL:eSOLMS as an Alternative 21st. Century New E-learning in Malaysia: Significantly, PjBL:eSOLMS works as an engine to develop students’ motivation via new online learning in the 21st. century. The PjBL is supported with “online” web-based system called e-SOLMS. It is hoped that this PjBL:eSOLMS becomes as alternative of new online technical and vocational education in Malaysia [3]. This new alternative 21st. century online PjBL are able to fulfill the needs of a large number of students who are involved in project development and it should work outside of classroom. Under the PjBL: eSOLMS concept, more than one in each group is compulsory to complete their project with success

before graduating. Many more are physically needed present in workshop or outside of the classroom but they fail to invest themselves fully in the experience of learning if they do not follow the PjBL:eSOLMS procedures [1].

There is an increased awareness in the Malaysia Technical Institutions such Polytechnics and Community College to force students to develop high skilled and competence to fulfill the needs of the industry [3]. New alternative learning such PjBL:SOLMS provides a match between those requirements. Technical students should be involved in the training and understanding of the PjBL: eSOLMS concept [3]. Full understanding of this concept will change technical student attitudes and their beliefs about the vitality of PjBL to develop student motivation [4]. Features in eSOLMS works are user-friendly and can assist supervisors in reducing student meeting and apathy. Project monitoring and assessment are done online through this PjBL: eSOLMS, hence makes it easy for everyone to access at any time and any place [5].

PjBL: e-SOLMS Alternative Technical Problem Solving:

PjBL:eSOLMS allows lectures/supervisors and students to create tasks whose complexity and openness mimic problems in the technical real world for project development. Students can see the interdisciplinary nature of PjBL: eSOLMS at each tasks and see that each task may have guided procedure that generates cognitive solution. Students who have the freedom to choose different strategies and approaches may become more engaged in the PjBL: eSOLMS learning process and these students will be more likely to approach other technical problems with open minds [4]. The guidance and monitoring process totally generated via PjBL: eSOLMS help students to get response from supervisor as soon as they registered all team members in the project. In addition, students who are involved in creating the project assignment or the project checklist gain valuable experience in setting their own goals and standards of excellence. This gives students a sense of ownership and control over their own technical and vocational learning [3]. Learners have the added opportunity to identify related skill work, machinery and explore them in a project based scenario [5]. Teaching with the project based learning (PjBL) method via eSOLMS enables students to work cooperatively with peers and supervisor in a student-centered environment. This method encourages learners to explore various topics of interest via learning object through eSOLMS [4].

Project based learning (PjBL) via eSOLMS that have depth, duration and complexity will challenge students and motivate them towards construction of knowledge in project development. They will acquire technical problem-solving, communication, collaboration, planning and self- evaluation skills. After completion of a project, students are asked to self-evaluate the project. Students also go through project testing and project evaluating before they present their projects. This enables students to focus on their learning process and allows them to see their progress [3]. Self-evaluation gives students a sense of accomplishment and further instills responsibility for learning [5]. The students are also evaluated continuously at each stage of the project. At the end, after project presentation, the cumulative marks will be calculated. Good marks resulted if each path of the project is successful. Learners who can see the connection between projects based task and the real world will be more motivated to understand and solve the problem at hand. Students enjoy learning when learning makes sense to communicate via online at any places and any time (eSOLMS). Project Based Learning (PjBL) lends itself to many disciplines and guidance. It provides learners the opportunity to have a voice in how and what they learn, while building intrinsic motivation towards technical problem-solving [5].

Completing the process of projects development can be fun for polytechnic students, especially if they know exactly what is needed while using PjBL:eSOLMS. Creating guidelines via PjBL:eSOLMS concept individually can be time-consuming though, so project team have to plan well to be meet the deadline. PjBL provide a pro forma project checklist (PjBL forms) for each students (group member). At first, students need to choose the grade level for the type of project that the students are supposed to do. With PjBL:eSOLMS, technical student can choose from writing, design, machinery used, lab test, workshop, literature, multimedia presentation and high technical projects development. Another aspect of the PjBL: eSOLMS involves parent monitoring. This aspect is still under development and is hoped to be launched soon. Parents can monitor the student's progress by referring to the list of project progress and guidelines. They will be able to see the weekly results of their children result at any time convenient to them via eSOLMS. This added value of eSOLMS provides new alternative for monitoring and facilitate external motivation from parents [3].

PjBL: eSOLMS Develops Students' Motivation:

According to Brophy [6], motivation to learn is a competence acquired "through general experience but stimulated most directly through modeling, communication of expectations and direct instruction or socialization by significant others (especially students, parents and lectures). "This PjBL:eSOLMS strongly fulfill the competencies needs of polytechnics graduates. The students' environment at polytechnic or community college shapes the initial constellation of attitudes they develop toward technical skills through this PjBL:eSOLMS. When lecturers or supervisors nurture their students' natural curiosity about online learning in the real world by welcoming their questions, encouraging exploration and familiarizing them with resources that can enlarge the real technical world, they are giving their students the message that real technical advance learning is worthwhile and frequently fun and satisfying [3].

During the pilot testing at Kota Bharu Polytechnic, engineering students, who are exposed to an advance learning such PjBL:eSOLMS, become motivated. At the same time, that nurtures a sense of self-worth, competence, autonomy and self-efficacy, they will be more apt to accept the risks inherent in learning. Conversely, when engineering students do not view themselves as basically competent and able, their freedom to engage in academically challenging pursuits and capacity to tolerate and cope with no failure in project development are greatly diminished [3].

Once this PjBL:eSOLMS was pilot tested at Kota Bharu Polytechnic, engineering students begin forming beliefs about their institution-related successes in developing their own trade mark based on international learning process. PjBL:eSOLMS provides resources through learning object. This object contains all the engineering materials, notes and references needed for the project development. Forum in the PjBL:eSOLMS provides a platform for students to work collaboratively to ensure their successes in project development. The students' effort, ability, luck, or level of task difficulty determines the success or failure in project development.

The beliefs that users themselves have about teaching and learning through PjBL:eSOLMS concept and the their nature of the expectations (in product development) also exert a powerful influence [2]. As Stipek and Deborah [7] notes, "to a very large degree, students expect to learn if their teachers expect them to learn." It is hoped that PjBL:eSOLMS is able to serve this purpose. The goals, policies and procedures of

Polytechnics and community college also interact with outside classroom climate and practices to affirm or alter students' increasingly complex learning-related attitudes and beliefs in producing innovative product and global engineering graduates. PjBL:eSOLMS is continuously serious in carrying out that needs and requirements [8].

Motivational web based such PjBL:eSOLMS is in accordance to the government policy. PjBL aims to achieve the success of the 21st century educational needs. Young students at primary schools who undergo project based learning (BTP:KPM) tend to maintain high expectations for success. The same concept is carried out for older students at the institutions of higher education. Student at IPTA or IPTS should view PjBL:eSOLMS as a "double-edged sword" in new 21st century vision in education [9]. If students' failure follows high effort occurs with the usage of PjBL concept, they will tend to carry more negative implications, especially for their self-concept of ability, than failure that results from minimal or no effort in learning style for developing their motivation [8].

Random Data Sampling Test at Mechanical Engineering Department, PKB:

Researcher selected 25 students at the Mechanical Engineering Department, Kota Bharu Polytechnic using random sampling method. This research is aimed to measure the effectiveness of PjBL:eSOLMS concept in increasing students' motivation. This quantitative research uses questionnaire as instrument to measure six empirical variables that are related to intrinsic and extrinsic motivation by using PjBL:eSOLMS concept. The project management subject utilizes standardized forms provided by the PjBL module inside eSOLMS echnology. These guided PjBL forms generate consistently and process monitoring by weekly progress via eSOLMS Technology. The forms embedded in the module are as follows:

- Form P001 - Project discussion and proposal.
- Form P002 - Project sketches and design.
- Form P003 - Supervisor's review and confirmation.
- Form P004 - Final technical project design and making methods.
- Form P005 - Project planning of each stage development and fabrication process.
- Form P006 – detailed drawings for each component measurement and workshop fabrication methods.
- Form P007 - project procedures and fabrication methods.

- Form P008 – writings of each team member for workshop selection that conforms to the standard planning form (P005). Each process should be drafted consistently at each stage to avoid delays.
- Form P008 – provide inputs for machines selection and present the calculation sheet for each component of the product making.
- Form P009 - final design of additional component and testing.
- Form P010 – evaluation and confirmation form for the components.
- Form P011 – evaluation and testing of any added value or component to innovative products produced and finally.
- Form P012 – submission and evaluation of the power point for final presentation.

The roles of actors are also particular in PjBL module development. Project-based learning module is structured to transform teaching from "lecturers/supervisors telling" to "engineering students doing". Engineering students become active problem-solvers and effective decision-makers rather than passive listeners. They collaborate or cooperate in groups, organize their activities, conduct research, solve problems, synthesize information, organize time and resources and reflect on their learning. Teachers change their role "from sage on the stage to guide on the side" and assume the role of cognitive and meta-cognitive coach (by asking, monitoring, probing, managing, group regulating, keeping moving) rather than knowledge-holder and disseminator [3]. The research questionnaire will carry on after six months of pilot project.

The value of Alpha Cronbach for the six items is 0.713. The overall mean for these six items is high i.e. 4.007.

Development of Intrinsic Motivation through PjBL:eSOLMS: Does it really matter whether students are primarily intrinsically or extrinsically oriented toward learning? A growing body of evidence suggests that it does. When intrinsically motivated, students tend to employ strategies that demand more effort and that enable them to process information more deeply [10].

Condry and Chambers [11] find that when students are confronted with complex intellectual tasks, those with an intrinsic orientation used more logical information-gathering and decision-making strategies than do students who are extrinsically oriented. Intrinsically oriented students also tend to prefer tasks that are moderately challenging, whereas extrinsically oriented

students gravitate toward tasks that are low in degree of difficulty. Extrinsically oriented students are inclined to put forth the minimal amount of effort necessary to get the maximal reward [10]. The level of motivation to learn among engineering students at Kota Bharu Polytechnic who utilize PjBL:eSOLMS concept was analyzed. This study finds that engineering students who are attached with PjBL:eSOLMS demonstrate increases in their intrinsic orientation [8]. Although not every conventional educational activity is able to increase intrinsic motivation, PjBL:eSOLMS can strongly motivate those engineering students intrinsically [8]. A pilot test conducted at Mechanical Engineering Department, Kota Bharu Polytechnic, proved this finding. The data analyzed shows that although overall process can capitalize on existing intrinsic motivation, there are several potential benefits for each technical institution who tries to carry out this valuable new e-learning task (PjBL:eSOLMS) [8].

Can Motivation to Learn Be Fostered in the Project Setting?: Although students' prior knowledge in mechanical engineering works can facilitate their usage of PjBL module setting via eSOLMS technology, it is essential for lecturers or supervisors to view the concept as "active online learning capable of stimulating students' motivation to learn" [12].

Activities outside the classroom climate is important [1]. If students perceive the outside of the classroom as a caring and supportive technical environment where there is a sense of belonging and everyone is valued and respected, they will tend to seek advancement in high technical knowledge [5]. Via this PjBL:eSOLMS concept, they will tend to participate more actively in the hands on technical and vocational learning processes [8]. Various task dimensions can also foster motivation to learn through this PjBL:eSOLMS concept [3]. Ideally, every task should be challenging but achievable to engineering students to follow up. Related online learning attached with outside monitoring also promotes motivation [13]. This PjBL:eSOLMS as does "contextualizing" learning and cross out of institutions areas. That is high value impact to ensure students' freedom to enrich their advance engineering outcome in project development. PjBL:eSOLMS works for helping engineering students to see how skills can be applied in the real world [3]. Every task develop on PjBL module involves "a moderate amount of discrepancy or incongruity" and is beneficial because it stimulates students' curiosity, which is an intrinsic motivator, consistently [3].

Process of PjBL:eSOLMS Explanation & Implementation



Fig. 1: PjBL:eSOLMS explanation for project implementation



Fig. 2: PjBL process via eSOLMS Technology for Development of Innovative Chopper



Fig. 3: An Innovative Product Development through PjBL:eSOLMS

Table 1: Alpha value of motivation scale

No.	Value of Alpha Cronbach	Alpha Std Value	N
1- 6	0.713	0.735	6

Table 2: Detailed analysis of 6 items of motivation Process of PjBL:eSOLMS Explanation & Implementation

Detailed analysis of 6 items				
No.	Impiricals	Mean	SD	N
1	Systematic of Activity	4.3600	0.75719	25
2	Easy & guided	3.8800	0.92736	25
3	Process motivated	3.8400	0.74610	25
4	Self development	3.7600	0.66332	25
5	Knowledge development	4.0400	0.61101	25
6	More Confident	4.1600	0.62450	25

Standard mean of 6 items: 4.007



Fig. 4: Project Presentation with PjBL;eSOLMS guide

In addition, defining tasks in terms of specific items in project based learning, short-term goals can assist engineering students to associate effort with success [7]. The purposes of specific tasks in PjBL:eSOLMS are achieved when engineering students are introduced to the guide (project procedures via PjBL;eSOLMS). This guide is also beneficial in project development outside the institutions [12]. This PjBL:eSOLMS also provide engineering students with extrinsic rewards. On the other hand, this PjBL:eSOLMS should be used with caution for engineering students in developing project since they have the potential for decreasing the existing intrinsic motivation [8].

What takes place in the classroom is critical, but "the classroom is not an island" [14]. Depending on their degree of congruence with classroom goals and practices, goals either dilute or enhance classroom efforts. To support motivation to learn, school-level policies and practices should stress "learning, task mastery and effort" rather than relative performance and competition [8].

PjBL:eSOLMS are Able to Help Unmotivated Students: It is a prerequisite for developers to recognize that even when students use strategies that are ultimately self-defeating by using PjBL:eSOLMS (such as withholding effort, cheating, procrastination and so forth), their goal is actually to protect their sense of self-worth [2]. A process on PjBL:eSOLMS called Centred Online Learning (Based at PKB server), which involves project management through PjBL modeling, socialization and practice exercises, is sometimes used with discouraged students. The goals of attribution retraining are to help students to (1) concentrate on the PjBL module forms and tasks rather than becoming distracted by fear of failure; (2) respond to frustration by retracing their steps to find mistakes or figuring out alternative ways of approaching a technical problem instead of giving up; and (3) attribute their failures to insufficient effort, lack of information, or reliance on ineffective strategies rather than to lack of ability via eSOLMS [3].

Other potentially useful strategies in PjBL:eSOLMS are summative assessment such rubric test weekly project progress and portray potential high technical skill development as incremental and domain-specific and focus on innovative products of project development [3]. Because of the potential payoff of having innovative product via PjBL:eSOLMS learning concept, engineering

students also become attached to the new e-learning style. This facilitate smooth monitoring by supervisors, students and parents in order to devote themselves to engendering, maintaining and rekindling students' motivation to learn and produce innovative products at international standards [8].

CONCLUSION

Students' motivation naturally has to do with students' desire to participate in the learning process. But it also concerns the reasons or goals that underlie their involvement or non-involvement in academic activities. Although students may be equally motivated to perform a task, the sources of their motivation may differ. A student who is intrinsically motivated undertakes an activity with PjBL:eSOLMS where they can learn for their own sake, for the enjoyment it provides, the learning it permits, or the feelings of accomplishment it evokes. An extrinsically motivated student performs in order to obtain some reward or avoid some external motivation to the activity itself, such as design, hand on skilled, or external works in engineering approval. The term motivation to learn through PjBL:eSOLMS has a slightly different meaning and disciplines in engineering methods involved. Motivation to learn in this PjBL:eSOLMS concept is characterized by long-term, quality involvement in learning and commitment to the project development process of engineering learning in the Malaysian technical education.

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