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Let's Do Projects

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ABSTRACT
Projects are defined as complex tasks, based on challenging questions or problems, that involve learners in design, problem-solving, decision making, or investigative activities; give learners the opportunity to work relatively autonomously over extended periods of time; and culminate in realistic products or presentations. Within a project-based approach, learners are usually provided with specifications for a desired end product, and the learning process is more oriented to following correct procedures. Teachers act as instructors or coaches, providing expert guidance, feedback and suggestions for better ways to achieve the final product. Past studies have shown the benefits of PBL which include intrinsically motivating learners to learn, fostering problem-solving, and developing independent and cooperative working skills. It is also believed that project based instruction allows learners to develop critical thinking and decision making skills and engage in in-depth learning of subject matter. This paper discusses the importance of Grant's structures in a project as an Invention Project was assigned to each group of learners. The results, based on the Grant structure, have indicated that learners showed a significant improvement in the areas highlighted in the project-based activity. It is thus, a worthy action to be implemented in teaching and learning processes.

Introduction

Let's imagine a group of learners setting up a permanent business after going through an entrepreneurial project assigned to them, or another group of learners putting up a stage performance based on their combined history of lives. These instances portray how teachers and learners are exploring new ways of collaborating through a model of teaching-learning labeled as project-based learning.

Project-based learning, which is rooted in constructivist theory, offers loads of opportunities of transforming classroom settings into active and dynamic learning environments. In this era of globalization, it is not sufficient for learners to only master the content, but also the '21st century skills' which is "one of the most ubiquitous terms in today's education debates" (Silva, 2009). 21st century skills will include among others: communication and presentation skills, organization and time management skills, research and inquiry skills, self-assessment and reflection skills, and also group participation and leadership skills, which are all of great importance. And project-based learning is one way to obtain those mentioned skills.

What Is Project-Based Learning?

There are often inconsistent postulations regarding what 'project work' is and how they can be conceptualized. At the most general level, project-based learning happens when learners acquire a comprehension of a topic or issue through some kind of participation in an authentic (or simulated) real-life problem, and in which they have some level of responsibility in designing their learning activities (Morgan, 2006). Wrigley (1998) posits that "in its simplest form, project-based learning involves a group of learners taking on an issue close to their hearts, developing a response, and presenting the results to a wider audience" and the project can last from only a few days to several months.

Project-based learning (PBL) 'is a model that organizes learning around projects' (Thomas, 2000). According to the definitions, projects are complex tasks, based on challenging questions or problems, that involve learners in design, problem-solving, decision making, or investigative activities; give learners the opportunity to work relatively autonomously over extended periods of time; and culminate in realistic products or presentations (Jones, Rasmussen, & Moffitt, 1997; Thomas, Mergendoller, & Michaelson, 1999). Within a project-based approach learners are usually provided with specifications for a desired end product (build a rocket, design a website, etc.) and the learning process is more oriented to following correct procedures. Teachers are more likely to be instructors and coaches (rather than tutors) who provide expert guidance, feedback and suggestions for better ways to achieve the final product. The teaching (modeling, scaffolding, questioning, etc.) is provided according to learner need and within the context of the project. However, not all projects assigned to learners can be considered a PBL. Thomas (2000) listed five major criteria for a project to be considered an instance of PBL:

PBL projects are central, not peripheral to the curriculum.

In PBL, projects are the curriculum. They are the central teaching strategy and learners encounter and learn the central concepts of the discipline via projects. This means that projects in which learners learn things that are outside the curriculum ("enrichment" projects) are not examples of PBL, no matter how appealing or engaging.

PBL projects are focused on questions or problems that "drive" learners to encounter (and struggle with) the central concepts and principles of a discipline.

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Learners undertaking a project must be encouraged to make a connection between activities for project completion and the underlying conceptual knowledge. This is usually done with a 'driving question' (Blumenfeld, Soloway, Marx, Krajeik, Guzdial & Palincsar, 1991) or an ill-defined problem (Stepien & Gallagher, 1993). According to Blumenfeld et al. (1991), 'the questions that learners pursue, as well as the activities, products, and performances that occupy their time, must be orchestrated in the service of an important intellectual purpose.'

Projects involve learners in a constructive investigation.

According to Thomas (2000), an investigation is a goal directed process that involves inquiry, knowledge building, and resolution. Investigations may be design, decision-making, problem-finding, problem-solving, discovery, or model-building processes. However, it is important to note that in order to be considered as a PBL project, the central activities of the project must involve the transformation and construction of knowledge (by definition: new understandings, new skills) on the part of learners (Bereiter & Scardamalia, 1999). If the central activities of the project represent no difficulty to the student or can be carried out with the application of already-learned information or skills, the project is an exercise, not a PBL project. This criterion means that straightforward service projects such as planting a garden or cleaning a stream bed are projects, but may not be PBL projects.

Projects are student-driven to some significant degree.

PBL projects incorporate a good deal more student autonomy, choice, unsupervised work time, and responsibility than traditional instruction and traditional projects. They do not end up at a predetermined outcome or take predetermined paths. Hence, laboratory exercises and instructional booklets are not examples of PBL, even if they are problem-focused and central to the curriculum.

Projects are realistic, not school-like.

PBL incorporates real-life challenges where the focus is on authentic (not simulated) problems or questions and where solutions have the potential to be implemented.

Why Project-Based Learning?

It is believed that one of the ways to promote critical and creative thinking skills is through the use of project-based learning. A variety of terms such as *project work* (Shoring, 1995), *project method* (Kilpatrick, 1926), *project approach* (Diffily, 1996), *project-oriented approach* (Carter & Thomas, 1986) and *project-based learning* (Peterson & Myer, 1995) are used in general education and in the L2 education literature. A project is defined as a long-term (several weeks) activity that involves a variety of individual or cooperative tasks such as developing a research plan and questions, and implementing the plan through empirical or document research that includes collecting, analyzing, and reporting data orally and/or in writing.

The major benefits listed in the general education literature include opportunities that it provides for intrinsically motivating learners to learn, fostering problem-solving, and developing independent and cooperative working skills. It is also believed that project based instruction allows learners to develop critical thinking and decision making skills and engage in in-depth learning of subject matter (Adderly, Ashwin, Bradbury, Freeman, Goodlad, Greene, et al., 1975; Berliner, 1992; Krajcik, Blumenfeld, Marx, & Soloway, 1994; Ladewski, Krajcik, & Harvey, 1994; Vithal, Christiansen, & Skovsmose, 1995).

Krajcik et al. (1994) report on a group of 11 experienced US science teachers learning the project approach to teaching. One of the research goals in this study was to investigate the challenges the teachers might face in learning to implement project-based instruction. The analyses of the videotaped observations, informal interviews, and teachers' reflection journals during their implementation of two six- to eight-week projects showed that the teachers liked teaching science through the project approach. They reported that compared with traditional methods, project-based science was more effective in promoting critical thinking, observation, and group work skills. The teachers said that in project-based science individual student thinking was continually affected by the input of others. Learners were pushed to consider increasingly broader perspectives, instead of narrowing their thinking as the unit progressed.

In four case studies, Marx, Blumenfeld, Krajcik, Blunk, Crawford, KelJy, & Meyer (1994) explored how four experienced US middle-grade teachers learned to teach project-based science. They reported discovering project-based instruction resulting in more active involvement, more independence from teachers, and more cooperation among learners. They also reported notable improvements in learners' learning of new concepts. Learners learned new concepts faster, retained them longer, and were able to use them in class discussions particularly for problem solving which required critical and creative thinking.

Renuka, Christiansen, & Skovsmose, (1995) explored how teachers and learners interpreted project-based mathematics education in a Danish university where learners are required to engage in project work for 50% of their time. They reported that in project work they could 'do mathematics,' could apply mathematics to other fields ('can see the connection'), and could learn from the process itself (e.g., problem-solving skills). They also said that project-based instruction allowed them to learn math thoroughly through in-depth study.

Beckett (1999) investigated the implementation of project-based instruction in a Canadian secondary school ESL class. Analysis of data collected through observations and interviews of two teachers indicated that the teachers favoured project based instruction because it allowed them to take an integrated approach to language teaching (i.e., integrating language, content, and skills). It allowed them to foster critical thinking and problem-solving skills and promote independent as well as cooperative learning skills.

Thomas (2000) defined the issues about the positive side effects of project based learning for learners as the development of positive attitudes toward their learning process, work routines, abilities on problem-solving, and self-esteem. Similarly, Green (1998) emphasized that participants in project-based learning learn better and are more actively acting in their learning. Instructors work backstage as learners work on their projects. This turns participants into active problem solvers on the projects, rather than passive receivers of knowledge. Preuss (2002) noted that as learners complete their projects, they think reflectively on their experiences about project-based learning processes individually. Besides, learners realize similarities between what they are learning and what is going on outside the school walls. This was also reported by Ramey (1997) who studied a group of US high school learners who voluntarily enrolled in a project-based calculus class. The participants believed project-based instruction enabled them to find real-world applications for their calculus. They believed they had improved their problem-solving and critical thinking skills by

conducting projects. They also believed project based calculus was intrinsically motivating and helped develop their skills for working in cooperative group settings.

Shepherd (1998) reports that problem-based learning can have a positive effect on learners' acquisition of critical thinking skills. Shepherd describes a nine-week project in which learners work on defining and finding solutions for a problem related to an apparent housing shortage in six countries. Although the number of learners involved in the study was quite small (20 learners in the experimental group and 15 in a control group), Shepherd found a significant increase on the part of the experimental group, as compared to the control learners, on a test of critical thinking skills (The Cornell Critical Thinking Test). Additionally, experimental learners reported increased confidence and learning, as a result of the nine-week project, on a self report measure given after the program.

Boaler (1997) describes a longitudinal study of mathematics instruction conducted in two British secondary schools. The study has several features that make it a significant study of Project-Based Learning effectiveness. The two schools were selected for their differences with respect to traditional versus project-based methods of instruction. One of the schools (referred to here as "traditional") was characterized as incorporating a more teacher-directed, didactic format for instruction. Mathematics was taught using whole class instruction, textbooks, tracking, and the frequent use of tests. At the second school (referred to here as "project-based"), learners worked on open ended projects and in heterogeneous groups. Teachers taught using a variety of methods with little use of textbooks or tests, and they allowed learners to work on their own and to exercise a great deal of choice in doing their mathematics lessons. The use of open-ended projects and problems was maintained in the project-based school. Learners at the project-based school outperformed learners at the traditional school on the conceptual questions as well as on a number of applied (conceptual) problems developed and administered by Boaler. They also developed more flexible and useful forms of knowledge and were able to use this knowledge in a range of settings.

A study conducted by the Cognition and Technology Group at Vanderbilt (1992), reported the significance of the study was that it demonstrated that a brief Project-Based Learning experience can have a significant impact on learners' problem-solving skills, metacognitive strategies, and attitudes towards learning. Results from the attitude surveys were similar to those reported by Boaler (1997). Tretten and Zachariou (1995) conducted an assessment of Project-Based Learning in four elementary schools using teacher questionnaires, teacher interviews, and a survey of parents. According to teachers' self-reports, experience with Project-Based Learning activities had a variety of positive benefits for learners including attitudes towards learning, work habits, problem-solving capabilities, and self esteem. In summary, they state that:

" Learners, working both individually and cooperatively, feel empowered when they use effective work habits and apply critical thinking to solve problems by finding or creating solutions in relevant projects. In this productive work, learners learn and/or strengthen their work habits, their critical thinking skills, and their productivity. Throughout this process, learners are learning new knowledge, skills and positive attitudes." (p.8)

Horan, Lavaroni, and Beldon (1996) observed Project-Based Learning classrooms at two time periods during the year, once in the fall and once in the spring semester. At both occasions, they compared the behavior of high ability to low ability PBL learners in group problem-solving activities. Observers looked at five critical thinking behaviors (synthesizing, forecasting, producing, evaluating, and reflecting) and five social participation behaviors (working together, initiating, managing, inter-group awareness, and inter-group initiating). The interesting finding was that lower ability learners demonstrated the greatest gain in critical thinking and social participation behaviors, compared to the high-ability learners.

There is ample evidence that PBL is an effective method for teaching learners complex processes and procedures such as planning, communicating, problem solving, and decision making, involving a lot of critical and creative thinking. Teachers in general favor using project-based instruction as they felt that learners benefit from the instruction in many ways. However, some learners expressed mixed feelings about it. Despite the fun they had while conducting the projects, they felt doing the project was a waste of time as it was time consuming and they had a lot of work to do for project completion. They also preferred the traditional approach as they felt that they really learned. Some thought otherwise though.

Project-based learning offers an engaging instructional method to make learners active constructors of knowledge. With the ideas of constructivism, constructionism and cooperative/collaborative learning, project-based learning has strong theoretical support for successful achievement. Grant (2002) identifies some common features across the various implementations of project-based learning, which include:

a) An introduction to the activity
b) A task
c) A process
d) Resources
e) Scaffolding and guidance
f) Cooperative/ Collaborative learning
g) Reflection

The following section illustrates the importance of these features to be included in a project. Additionally, the writers would like to share a project conducted at a local university which has the corresponding elements as mentioned by Grant (2002).

The Project

This section is “to set the stage” or “anchor” the activity (Grant, 2002), which thereafter will contribute to the motivational aspect of the learners, who might otherwise feel that school is boring and mundane. According to Wrigley (1998), progressivists believe that learners “learn best through experiences in which they have an interest and through activities that allow for individual differences”. It is advisable for teachers to observe learners’ interests in order to connect what learners would like to know and what the classroom provides. From there, the introduction has to be crafted in a way that motivates learners to build knowledge and achieve personal growth.

A task

The task serves as the guiding or driving question. It assists in explaining what has to be done by the learners. In other words, it conveys what the learners should accomplish. It is vital that the task is appealing, stimulating and challenging, yet a doable one. An effective task will also produce a project that is complex, thought-provoking and also highly intriguing, where learners will create their own knowledge. In addition, the task

should also address authentic concerns. Some good examples are highlighted in Wrigley (1998) such as:

- Projects that involve personal or cultural expressions of self and community, such as oral histories.
- Projects that draw on learners' creative impulses where learners may develop memory books, design original books for their children, write short plays and skits, produce poetry and songs, or compile a collection of sayings and events from their childhood that will be preserved for their children.
- Projects that stress expression of the human spirit through language and literature that reflect relevant orientation to learning.
- Projects that help learners meet critical needs by helping them in adapting to new environments or function more effectively in familiar ones, for instance: a handbook written by learners for new learners, tips and advice on how to deal with admission requirements of a university/institution.

With an interesting task, the motivation is likely to be higher, and at the same time, learners are engaged in the process where they become inquisitive about answers, resulting in more and more in-depth search of information. At the same time, mutual work ethics are shared too.

Process

The process will encompass the steps necessary to solve the task, which ought to incorporate activities that call for higher-level thinking (analysis, synthesis and evaluation) and critical thinking skills (Grant, 2002). By having the 'process' element, learners will gain a greater awareness of their own abilities in research and report findings, and also improve on their attitudes, self-efficacy and 'can do' skills (Curtis, 1990 in Wrigley, 1998). In addition, the ability to devise a project and see it to completion; obtaining knowledge and insights and mastering technologies are also the advantages. This in turn will help to produce more autonomous and self-propelled learners who can progress on their own beyond the classroom settings.

Resources

Resources supply data to be used such as hyperlink texts, scientific probes, eyewitnesses (Grant, 2002). According to Wrigley (1998), not all projects are successful- as some learners may feel that teachers are abdicating their roles if they do not provide answers, or simply because learners may not want to learn with and from their peers. By having some kind of resources, the learners will have a trace of directions toward their learning and discovery while carrying out the task of the project. Nonetheless, some learners may not necessarily need a 'fixed' list of resources as they are able to explore and discover the assigned task on their own. Still, it makes a difference if teachers own "a tolerance for ambiguity, some skill in helping learners negotiate conflicts and enough self-confidence to not give up when a project peters out or refuses to come together" (Wrigley, 1998).

Scaffolding and guidance

No matter how similar a student appears to be with another fellow student in terms of academic abilities, they are actually different, in many ways. Heterogeneousity in classes is common. Learners come from different learning background, bringing with them different experiences. They have different learning strategies, for example, visual, audio, kinesthetic, left-brained and right-brained types. There are also learners with specific learning difficulties whose needs are different. Learning in a rich, authentic context as suggested in project-based learning can be challenging for learners. Thus, scaffolding from teachers and support from peers are necessary. Collins, Brown and Newman (1989) in Liu and Hsiao (2002), suggest that learners should be engaged in 'cognitive apprenticeship'- where teachers give modeling, coaching and scaffolding to learners to aid their learning process. Providing scaffolding or guidance is important as it will enable learners to move beyond their existing level, progressing and developing further. In the case of a project, scaffolds can be in the form of worksheets, project templates and guidance from a facilitator.

Cooperative/ Collaborative learning

The '21st Century Skills' refers to a set of skills, competencies and habits that require learners to do much more than remember information. They need to engage in higher-order thinking skills. They have to learn to work as a team and contribute to a group effort. They must listen to others and make their own ideas clear when speaking. Generally, when people are supposed to work in a group they need to co-operate and help each other to succeed. This is where project-based learning comes in. Collaboration is an important aspect of much project-based learning. Paris and Turner (1994) point out that when learners work collaboratively, they provide comments and share ideas. These comments and ideas have motivational effects and are believed to be able to inspire others. Collaboration also improves communication, negotiation, and problem-solving skills, among others. There are a variety of ways in which collaboration can be achieved. For example, learners could work in groups, with individuals or small sub-groups taking responsibility for different areas of the project, or they might instead work alone on a project and then conduct peer reviews of one another's work.

Reflection

It is important that learners receive feedback on their performance or work. And project-based learning allows this. Learners should be encouraged to see that even if certain aspects of the project did not work out as planned, what they have learned along the way is important. Learners need to learn to analyse both the teacher's and their own work and become aware of the value of project work. Final evaluation is a valuable feedback both for the teacher and the learners. Hence, successful and well crafted projects deserve to be presented to others. This is because, what learners know is demonstrated by what they do, and what they do must be open to public scrutiny and critique. Then only they can use peer critique to improve their work to create higher quality products. With a constructive reflection it is possible to improve future project attempts. The paper continues with a description of a model case that the writers use in their project-based learning, presenting the 7 features highlighted by Grant (2002). Table 1 illustrates the structure/anatomy of the invention project assigned to the learners that correspond with the common features highlighted above.

Conclusion

Having mentioned the nature and benefits of project-based learning, it is valid to say that project-based learning is synonymous with learning in depth. A well devised project can provoke learners to encounter the fundamental concepts and ideas of a subject or discipline. Also, a successful project-based learning will enhance learners' enthusiasm and revitalize the class and teachers. The many facets of learning addressed in project-based learning are worth a try, and it is indeed a promising approach. It is therefore, worthy to employ project-based learning in teaching and learning

Table 1: The Structure/Anatomy of Invention Project

 USIM YOUNG INVENTORS FAIR	
Hey Everyone! An Invention Contest will be held in conjunction with the English Language Support Programme 3 (ELSP 3). We know that you're creative and inventive! This is your chance to show your stuff! We invite you to come up with an invention or innovation that can solve problems of our daily lives.	*Introduction* *This section is "to set the stage" or "anchor the activity" (Grant, 2002). It will also aid in the motivational aspect.*
Here's what you have to do: As a class, create or design an invention (in various categories such as home improvement, house wares, automotive, apparel, industrial, medical, garment care, cleaning, hardware, lawn and garden etc.) Your great inventions will be showcased at Stadium Tertutup Nilai on 18th June 2009 during the USIM YOUNG INVENTORS FAIR.	*Task* *The task serves to explain what should be accomplished, and it should be appealing, stimulating, yet doable.*
Attention to the following guidelines will ensure an enjoyable experience with your inventions and a successful presentation of your work. A. Technical Details 1. Project Title – Provide a name for your precious invention. 2. Blueprint / Sketch / Proposal – You must prepare some sort of working paper or an outline of your invention which explains how your invention works and how it can benefit the users. 3. Replica / Prototype – You are also required to produce a model of your invention to be presented to the audience. The use of visuals / graphics / pamphlets/ brochures etc. is also very much encouraged. 4. The replica can be displayed at your booth, as assigned by the English Unit (Please refer to the floor plan attached, for the location). 5. Your invention booth must be set up between 8.00 am and 9.00 am on 18th June, 2009. 6. Your invention must remain in place until 1 p.m. on 18th June, 2009. 7. The groups of which their booths remain uncleared after 1.30pm on 18th June 2009 will be fined/penalized/ punished. B. Presentation Content Contestants are free to present a project related to any selection of areas mentioned earlier. In doing so, you are required to employ your research skills which include – reading and gathering information, synthesizing, group discussion, etc. Be prepared to describe the information you have gathered, explain the layout and mechanism of your invention, and illustrate through a demonstration session. As this is a part of the English Language Support 3 Programme (ELSP 3), please be reminded to appoint an editor among you to check your language use. Also, you will need to select 3-4 speakers to present your class creation to the judge. The main idea of this USIM YOUNG INVENTORS FAIR is to inculcate passion and awareness toward the use of English language.	*Process* *This includes the essential stages needed to fulfil the task assigned. The process should incorporate "activities that require higher-level thinking, such as analysis, synthesis and evaluation of information" (Grant, 2002).* *Guidance & Scaffolding* *This is to provide assistance to learners whereby according to Grant (2002), it can include student-teacher interactions, practice worksheets, peer counselling, project templates etc. In this invention project, learners worked in their respective groups with the help of a lecturer/facilitator.* *Resources* *Resources supply data to be used such as hyperlink texts, scientific probes, eyewitnesses (Grant, 2002). Again, in this invention project, learners worked in their respective groups with the help of a lecturer/facilitator.* *Cooperative/Collaborative Learning* *By working in groups, learners experienced the cooperative/collaborative learning and also benefitted from the peer/group review sessions.*
C. Judging You will be given a fifteen-minute window to showcase your invention with the judges. Judging sessions will consist of a ten-minute presentation given by each group plus a five-minute question-and-answer period. Judges will spend time talking to you, asking questions and listening to your descriptions of your design. The selection of the winning presentations will be based on: • Initiative - Originality and creativity of your invention • Language Aspect - The clarity of oral presentation • Communication Aspect - Your overall responses to the questions of the judges, and • Team work	*Reflection* *A good project-based learning ensures a chance for "closure, debriefing or reflection" (Grant, 2002). In the invention project, the 15-minute window to explain to the judges provided the platform to do so, apart from the in-class discussion sessions prior to the USIM Young Inventors Fair.*

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