

# Teaching 21<sup>st</sup> Century Skills to Engineering Students Through Project-Based Learning (Social Semiotic Perspective)

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**Abstract**---The 21<sup>st</sup> century skills include 3 main skills and 12 sub skills are indispensable in teaching English particularly for engineering students. Globalization has intensified the demands for communicative engineers having soft skills such as effective communication, cooperation, teamwork, project management, lifelong learning that become the requirements of industries and professional organizations. This descriptive-evaluative research aims at describing the procedure of teaching 21<sup>st</sup> century skills to Engineering students through Project-Based Learning (PjBL) and evaluating PjBL from student's voice. The research subjects involved 37 Civil Engineering students of a private engineering institute in Surabaya city. They were instructed to develop English online magazine as their group-projects. Guided using socio semiotic approach, the students eventually could publish three online magazines containing Civil engineering news at the end of semester. The results also revealed that the students learned and experienced a lot about 12 skills of 21<sup>st</sup> century skills. Moreover, through PjBL, their English language skills developed well specifically in reading, speaking, and writing ones when addressing issues related to Civil Engineering.

**Keywords:** the 21<sup>st</sup> century skills; PBL; engineering students

## I. INTRODUCTION

Teaching English to Engineering students belongs to English for Specific Purposes (ESP) which is more focused on the practice of specific disciplines (and professions alike). Unfortunately, many vocational universities/institutes still teach General English to their students and do not have relationship with texts and practices specific to their discipline/profession. The possible use of teaching

methodology which is different from that of general English sets up another point of adjustability in the principles of ESP. Two criteria of English course to be based on ESP are: first, ESP is normally directed to a goal associated with academic or occupational demands of using English. Second, An ESP course is based on the learner need analysis. Moreover, the target audience of ESP course is typically adult learners and/or possibly advanced students. Thus, the selection of materials, the setting of classroom tasks and activities, learning strategies, language skills and components taught, and syllabus design for ESP must be designed carefully by accommodating the learners' needs.

The concern about proficiency is important in ESP (English for Specific Purposes) because the language used must effectively and efficiently receive and convey messages for work or professional purposes (Bhatia, Anthony, & Noguchi, 2011).

## ESP as Professional Practices and 21<sup>st</sup> Century Skills

ESP aims at meeting the challenges of the present-day interdisciplinary demands and practices of the academy and the world of professions. These challenges have emerged as a result of several developments, some of which include, the growing tensions between the world of work and that of the academy, the complexities of the modern multi-media encouraging creative forms of information design and presentation, the increasing interdisciplinary nature of most university academic programs, and the overwhelming colonization and appropriation of generic resources within and across disciplines.

The 21<sup>st</sup> century skills refer to 12 abilities that today's students need to succeed in their careers during the Information Age. According to OECD (2008), the twelve 21st Century skills consist of 3L main skills and 12 sub-skills as follows:

1. Learning skills (the four C's) teach students about the mental processes required to adapt and improve upon a modern work environment. These skills comprise: 1) Critical thinking, 2) Creativity, 3) Collaboration, 4) Communication.
2. Literacy skills (IMT) focus on how students can discern facts, publishing outlets, and the technology behind them. There's a strong focus on determining trustworthy sources and factual information to separate it from the misinformation that floods the Internet. They consist of 1) Information literacy, 2) Media literacy, 3) Technology literacy.
3. Life skills (FLIPS) take a look at intangible elements of a student's everyday life. These intangibles focus on both personal and professional qualities. They include: 1) Flexibility, 2) Leadership, 3) Initiative, 4) Productivity, and 5) Social for life Skills.

These skills are intended to help students keep up with the lightning-pace of today's modern markets. Each skill is unique in how it helps students, but they all have one quality in common.

The 21<sup>st</sup> century skills must be taught in higher education because universities will create graduates who have not only learning skills and literacy skills, but also life skills. Universities must develop students' critical thinking and problem solving as they are considered to have higher-level cognitive abilities.

Recent research in genre analysis clearly favors a model of ESP which focuses on the acquisition of professional expertise, which integrates discursive competence, disciplinary knowledge and professional practice in a complex and dynamic manipulation of socio-pragmatic space within which most forms of specialized communication take place. ESP and 21<sup>st</sup> century skills must be focused on preparing students for jobs and technologies to future solve problems through language education.

### **Social Semiotic Perspective**

Social semiotic approach refers to an interdisciplinary model of language and language learning which lays an intersection between linguistic, sociology, anthropology, and education (Halliday, as cited in Teramoto 2010). A Hallidayan social semiotic perspective divides functions of language into experiential (representing experience of the world), logical (creating logical connections among various elements of a text to create a coherent whole),

interpersonal (enacting social roles/role identities), and textual (creating a coherent whole).

Teaching with texts engages learners in making meanings (Mickan, 2013). Texts are comprehensible, contextualized resources for selective expression and purposeful composition and meanings. These are authentic engagements with language in use. Besides, teaching social practices as authentic experience must also be taught to vocational students. They share and debate ideas, solve problems, compose arguments, and create objects collaboratively belongs to socialization of students.

### **Project-Based Learning**

One of characteristics of 21st-Century Teacher is applying Project-Based Learning (PjBL) in the classroom. PjBL is often used to promote self-regulated learning or learning autonomy. It is a teaching method designed to engage students in investigating complex questions while developing their knowledge and skills (Markham, Larmer, and Ravitz, 2003). PjBL can create students' learning habits of how to use what they know and how to find information they do not know independently or autonomously. According to Helle et al (2006), the main outcome of PjBL is having the students create a product, thus PjBL stresses both the process and the product.

As today's students have access to authentic resources on the web, experts anywhere in the world, and peers learning the same subject somewhere else, teaching with textbooks is very 20th-century. Today's students should develop their own driving questions, conduct their research, contact experts, and create final projects to share, all using devices already in their hands. All they need from their teacher is guidance. Thus, the success of PjBL depends on the degree to which the instructor or lecturer give guidance for self-guided exploration based on the assignment given. Antic and Spasic (2012) describe that PjBL belongs to an essential tool to foster students' problem solving and critical thinking skills. This research described the implementation of a Project-Based Learning for developing English online magazine to the students of Civil Engineering Department within socio semiotic perspective. It also evaluated the PjBL from the students' voices.

## **II. METHOD**

This descriptive-evaluative research was carried out in the odd semester of 2019-2020 by involving 37 students of Civil Engineering Department. The research subjects were the fifth semester students taking the course of English 1. The data were collected by describing the procedure of teaching 21<sup>st</sup> century skills through project-based learning. Questionnaires

were then distributed to the students as a sort of evaluative statement.

Table 1 presents the agenda from meetings 1-14 for driving the students to the project of English online magazine.

Table 1 Class Agenda per Meeting

Meeting	Agenda
1	Introduction
2	Group presentation and Tenses
3	Group presentation and Tenses
4	Group presentation and active-passive sentences
5	Poem and Puzzle (creative writing)
6	Advertisement (campus promotion)
7	Introducing online tool for checking grammar and improving the quality of writing
8	Introducing a project of English online magazine, giving the outline of magazine and explaining compulsory and optional contents, dividing the students into 3 groups.
9	Presenting the outline of English Magazine & job description of team member.
10	Checking the progress in terms of content
11	Checking the progress in terms of content
12	Checking the progress in terms of grammar and lay out
13	Finalizing draft and uploading the English magazine draft on the Issue
14	Giving comment and suggestion to other group's magazine

Table 2 The lecturer's outline of English online magazine

Page	Content
1	Cover
2	Team Member
3	Preface
4	Table of contents
5	Free topic
6	Free topic
7	Free topic
8	Free topic
9	Free topic
10	Free topic
11	Free topic
12	Free topic
13	Free topic
14	Free topic

15	English poem
16	English puzzle
17	My plan in 15 years later
18	Civil engineering Prospects
19	Campus Promotion
20	The symbol of campus

### III. Results and Discussion

#### 1. Teaching the 21<sup>st</sup> century skills through PjBL

This research designed PjBL for Civil Engineering students for accomplishing a group project of English online magazine. Table 3 demonstrates the contents of English online magazine of Groups 1, 2, and 3, following the outline given by the lecturer as shown in Table 2.

Table 3 The Contents of English Online Magazine Designed by the Students

Page	Group 1 (12 students)	Group 2 (12 students)	Group 3 (13 students)
1	Cover	Cover	Cover
2	Our Team	Preface	Team member
3	Preface	Team member	Team member
4	Table of content	Table of content	Table of content
5	Lapindo mud concrete	Table of content	The history of civil engineering
6	Civil engineering discoveries: Hazardous & toxic waste for concrete	Comic	The importance of Civil Engineering in life
7	Technology: Spider Excavator	Motto	The importance of Civil Engineering in life
8	Artificial Intelligence	Bridge history	Innovation in Civil Engineering
9	Bevel interview	Picture of bridge	Expectation vs reality
10	Civil Engineering outfit	Civil engineering for dummies	Top 5 campuses with Civil Engineering Department
11	Health: enough one,	Why the sky is blue	Top 5 campuses

	can kill thousands of people		with Civil Engineering Department
12	Paradise vacation	Innovation in Civil Engineering	Top 5 ancient buildings
13	Paradise vacation	How to deal with stress	Top 5 ancient buildings
14	Horror story: Darmo haunted house	Motivation page	Top 5 unique buildings
15	Fun poem	Digital corner SAP 2000	English poem
16	Puzzle	Auto CAD	English Puzzle
17	My plan	The most popular competition as Civil Engineering student	My plan in the next 15 years later
18	Civil Engineering prospects	Puzzle	Prospective jobs of Civil Engineering
19	ITATS Civil Engineering	English Poem	ITATS Civil Engineering
20	ITATS symbol	My Plan	ITATS Symbol
21	-	Prospective jobs of Civil Engineering	-
22	-	How does lignification work	-
23	-	Reasons to choose Civil Engineering	-
24	-	ITATS symbol	-
25	-	Editor Team	-

**Notes:**

The links of the students' English Magazine

Group 1

[https://issuu.com/novan.avilion/docs/novan\\_dwi\\_avi\\_1ion\\_s\\_team\\_bevel\\_magazine](https://issuu.com/novan.avilion/docs/novan_dwi_avi_1ion_s_team_bevel_magazine)

Group 2

[https://issuu.com/fatchulamin25/docs/bevel\\_magazine\\_fix\\_sudah\\_selesai](https://issuu.com/fatchulamin25/docs/bevel_magazine_fix_sudah_selesai)

Group 3

[https://issuu.com/alaliyahamdi122/docs/magazin\\_bevel\\_rahma\\_team](https://issuu.com/alaliyahamdi122/docs/magazin_bevel_rahma_team)

All the contents of English online magazine must be related to Civil engineering. There were some compulsory contents such as puzzle, poem, campus promotion, and Campus symbol. The students were also given chances to develop their magazine with free topics about Civil Engineering. To realize a successful transition from an academic environment to a real-life environment, lecturer/instructor needs to equip the students with an awareness of systemic literacy (Brown, 2008; Noguchi, 2010). The connection of language and community is described as “systemic literacy” which suggests ESP practitioners to acquire the disciplinary knowledge and language.

**2. The evaluation of teaching 21<sup>st</sup> century skills through PjBL**

After the students has accomplished the project of English online magazine, they were instructed to fill the following questionnaire as a sort of evaluation.

Table 4 Student Questionnaire for PjBL Evaluation

<b>Questionnaire</b>	
1.	What do you think about the project of online English magazine? Was it difficult, easy, or challenging? In what aspects did you feel so?
2.	What news was yours? How did you create the contents of your English magazine? Did you translate the news from Indonesian to English? Did you compile them from original English sources? Did you paraphrase the news using your own language?
3.	What is the name of your magazine? What does it mean? What were your considerations in choosing some news?
4.	a. What parts of your magazine do you like best? Why? b. What parts of your magazine do you dislike most? Why?
5.	Writing a poem belongs to one of creative writing products. What can you learn from writing English poems?
6.	Editing and lay outing are not easy. What do you think about this statement?
7.	Put in a rank these following skills from the most important to the less one during accomplishing the project: a. Critical thinking b. Creativity c. Collaboration d. Communication e. Information literacy f. Media literacy g. Technology literacy h. Flexibility i. Leadership

j. Initiative  
 k. Productivity  
 l. Social skills  
 Why do you put .....at the first and why do you put .....at the last?

**1. What do you think about the project of online English magazine? Was it difficult, easy, or challenging? In what aspects did you feel so?**

**Reasons of being easy:**

- a. This project was conducted in group.
- b. The materials had been taught by the lecturer.
- c. The materials are related to the students' major course.
- d. The project is easy because the team is solid and compact.
- e. Accomplishing a group project of magazine improves the relationships among friends.
- f. There has been job description.
- g. The project can broaden the student's knowledge about Civil Engineering.
- h. Playing colors and pictures during accomplishing the magazine is fun.

**Reasons of being difficult:**

- a. Making a magazine requires creative ideas.
- b. Editing process is difficult.
- c. Combining all ideas of team members in agreement is difficult.
- d. Gathering all team members is difficult.
- e. One of students felt difficult when he was instructed to make an essay that he did not really know the topic.

**Reasons of being challenging:**

- a. It is the first time for the students to be assigned for creating a magazine.
- b. Finding ideas that are attractive to be presented in the magazine is challenging.
- c. Making job description of each member is challenging.
- d. English magazine demands more exposure in English vocabulary.
- e. To attract attention and interest of readers, the students require creative ideas concerning the contents of magazine.
- f. One of students felt fun in the editing process of the magazine so that the readers enjoy the news.
- g. Students have to explore various concepts regarding their disciplines.

- h. The students can learn Civil engineering in different methods, exactly through language learning.
- i. The student likes to design each page.
- j. The aspects of editing, content choices, and lay outing are challenging.
- k. They learn a lot about translating texts and choosing correct words to be written in the magazine.
- l. Making puzzle and poem is challenging.
- m. The students have to accomplish their project to meet the due time.
- n. The project can improve the student's writing skill.
- o. Team work, opinion exchanging, and writing discoveries in Civil Engineering are challenging.
- p. The project can help the students to enrich their English.
- q. Making a comic, editing the content, and designing a cover are challenging.

**2. What news was yours? How did you create the contents of your English magazine? Did you translate the news from Indonesian to English? Did you compile them from original English sources? Did you paraphrase the news using your own language?**

All students read and discuss some news from many sources. They involved translation and paraphrasing processes.

**3. What is the name of your magazine? What does it mean? What were your considerations in choosing some news?**

All students in the class agreed to name the magazine "BEVEL", stands for Bright, Essential, Virtuous, Endearing, and Likeable. Besides, BEVEL belongs to one of Civil Engineering terms. The student chose some news related to their major study and they must be up to date and interesting.

**4. a. What parts of your magazine do you like best? Why?**

Technology and interview, prospective jobs of Civil Engineering, discoveries, paradise vacation, overseas bridge, artificial intelligence, innovation, puzzle, dummies, interview, poem, technology, safety device, photo session, ancient building.

**b. What parts of your magazine do you dislike most? Why?**

Lapindo mud, puzzle, horror story, motivation page, my plan in the future, digital corner, liquefaction, cover, campus promotion, prospective job, competition, member photo, top 5 campuses.

**5. Writing a poem belongs to one of creative writing products. What can you learn from writing English poems?**

Through writing English poem, students can improve their writing skill in different ways, increase vocabulary, learn poem rhyme, spelling, and study parts of speech.

**6. Editing and lay outing are not easy. What do you think about this statement?**

All students agree that editing and lay outing are difficult as their background is Civil Engineering which mostly works with Autocad, Sketch up, Matlab, 3D Max Program, Hec-ras, etc. To do editing and lay outing, they have to use Adobe in Design and good editing skill. The layout must be right so as to be interesting for readers.

**7. Put in a rank these following skills from the most important to the less one during accomplishing the project:**

- a. Critical thinking
- b. Creativity
- c. Collaboration
- d. Communication
- e. Information literacy
- f. Media literacy
- g. Technology literacy
- h. Flexibility
- i. Leadership
- j. Initiative
- k. Productivity
- l. Social skills

**Why do you put .....at the first and why do you put .....at the last?**

Table 5 First and last skills in the Magazine Project

First skill	Last skill	T
Initiative	Technology literacy	1
Collaboration	Social skill	1
Creativity	Information literacy	1
Creativity	Flexibility	2
Leadership	Productivity	1
Communication	Technology literacy	1
Leadership	Information literacy	1
Leadership	Flexibility	2
Flexibility	Leadership	1
Leadership	Media literacy	6
Creativity	Flexibility	1
Initiative	Media literacy	2
Critical thinking	Information literacy	1
Leadership	Social skill	1
Communication	Collaboration	2
Information literacy	Productivity	1

Leadership	Collaboration	1
Creativity	Leadership	1
Creativity	Communication	1
Collaboration	Creativity	1
Creativity	Media literacy	1
Media literacy	Productivity	1
Information literacy	Critical thinking	1
Initiative	Social skill	1
Productivity	Leadership	1
Leadership	Social skill	1
Critical thinking	Technology literacy	1
Critical thinking	Flexibility	1

Note:

T = total students

PjBL will be successful as a medium for teaching 21<sup>st</sup> century skill when there is sufficient guidance and regular progress monitoring from the instructor/lecturer. In general, Savin-Baden (2003) mentions two challenges for teaching staff in PjBL:

1) to be a facilitator who is aware of how they teach, why they teach that

way and how their teaching is perceived by students,

2) to equip the students to take control of their own learning.

PjBL requires the teacher to shift his role from traditional instructor to facilitator who guides and supports the learning process to stimulate the students' cognitive learning process and problem-solving skills. As a facilitator, the teacher needs to know when to and when not to intervene the project. Besides, the instructors also help the students stay motivated and focused.

In the evaluation regarding question number 7, the students really understood the differences among the 12 skills of 21<sup>st</sup> century skills. They could put in a rank which skill to be the first and which one to be the last based on their personal experience in accomplishing the project of English online magazine. Although they had various personal reasons for putting those skills in a rank, overall, they had experienced all skills through this group project.

The PjBL for English online magazine encouraged the students to have critical thinking for finding solutions to problems, creativity for thinking outside the box, collaboration for working with others, and communication for talking to others in team. The students must have creative ideas to search and present news topics which are attractive and not monotonous to readers. In meeting 9, they were instructed to have classroom presentation on what materials they are going to

include in their magazine; just to make sure that every group will have different contents.

Furthermore, their Information literacy for understanding facts, figures, statistics, and data; Media literacy for understanding the methods and outlets in which information is published; and Technology literacy for understanding the machines that make the Information Age possible improved well through this project including editing and lay outing abilities. In this context, the students were instructed to gain the materials from Indonesian and English news. If they were from Indonesian materials, then they students must translate them into English and use online grammar checker to fix grammatical mistakes. In meeting 7, the researcher introduced paperrater online device to assist the students check the grammar and improve the quality of writing. Meanwhile, when the materials were from English texts, then the students must paraphrase them first and then check the grammatical mistake through paperrater online service.

The students got many exposures in skills related to Flexibility for deviating from plans as needed; Leadership for motivating a team to accomplish a goal; Initiative for starting projects, strategies, and plans on one's own; Productivity for maintaining efficiency in an age of distractions; and Social skills for meeting and networking with others for mutual benefit. The project of English online magazine has time constraint. Every classroom meeting has strict agenda and the students must meet all agendas. They must have leadership such as setting the job description of each member in meeting 9.

#### IV. CONCLUSION

PjBL can be used for teaching 21<sup>st</sup> century skills to students of Civil Engineering as long as the lecturer/instructor gives sufficient guidance and regular monitoring to the students' progress. In PjBL, the instructor plays a role as a facilitator who guides and supports the learning process to stimulate the students' cognitive learning process and problem-solving skills. Through social semiotic perspective, the students learned about both English language and their specific discipline. Since the PjBL was carried out in group and had time limit, the students learned and experienced a lot about all 21<sup>st</sup> century skills.

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