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The Effectiveness of Project-Based Learning on Students' 21st Century Skills in a Thai EFL Setting

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Abstract

School curriculums have traditionally involved preparing students to academically succeed through conventional teaching methods, yet they often fail to include the opportunity for non-academic outcomes, such as creative and critical thinking skills. Supporters of more contemporary teaching methods assert that students learn these 21st century higher order skills within a Project-Based Learning class, rather than in a regular curriculum class. The purpose of this study was to find out how effective project-based learning is on students’ problem-solving and decision-making skills, and their collaborative working with peers. The intention was to demonstrate that 21st century higher order skills benefit students in, and outside of, the modern classroom. Thirty 11-12 year old English Program learners and four Maths and Science teachers were selected from a school in Bangkok, and qualitative and quantitative data analysis were used to obtain relevant information, opinions and perceptions towards the topic. Findings from the research confirmed that students were highly engaged and motivated in project-based learning and strengthened the perception that it helped them to solve problems better, make decisions quicker and work more closely with their friends. Furthermore, teachers deemed project-based learning to be very effective on students’ higher order skills applied in their regular Maths and Science classes. To the extent how this could be assessed made the findings relatively limited, therefore by what method could accurately measure the effectiveness of project-based learning on students’ 21st century skills could be researched further. Overall, project-based learning ensures students develop into confident, skilled and learned individuals.

I. Introduction

a. Rationale for Research

In recent years, schools have approved a change in their curriculums from traditional teaching methods to that of a Project-Based Learning (PBL) model. Supporters of PBL claim that outcomes from the model include better performance in academic and non-academic subjects. While previous school curriculums have been concerned with preparing students to academically succeed in quantifiable measures, such as end-of-year assessments (¹O-Net, GAT, PAT and SAT), such approaches often fail to include the opportunity for extensive problem-solving, decision-making, collaborative and critical thinking skills. PBL contributes to such non-academic outcomes and making the curriculum connect to ‘real-world’ issues, in addition to the established academic outcomes.

Former President Obama stated that we need to find out whether students possess skills for the 21st century; skills such as problem solving, critical thinking, creativity, and entrepreneurship (Toch, 2011).

The purpose of this study is to find out how effective project-based learning is on students’ problem-solving and decision-making skills, and their collaborative working with peers. The intention is to demonstrate that 21st century higher order skills benefit students in, and outside of, the modern classroom.

In today’s classrooms, students need more than academic knowledge to succeed. Educators are dually tasked with increasing core subject comprehension and developing 21st-century skills, especially in STEM (Science, Technology, Engineering and Mathematics). PBL is designed to do both. By students solving real-world challenges in their own community, a connection can be made between these modern skills and the ever-changing world.

A break down why each of these skills are critical to students’ lifelong development follows:

- Problem-solving in the context of a specific project forces students to assess their metacognitive strategies, or way of thinking, and in turn develop a greater understanding of how they learn. With this awareness, students can visualize how to navigate the path to success through any challenge, in or out of school.

¹ O-Net is the Ordinary National Education Test and is taken at grades 6, 9 and 12 in Thailand. GAT means General Aptitude test and PAT is the Professional Aptitude Test, which must be sat for university admissions in Thailand, whereas SAT is the Scholastic Assessment Test and used more internationally for college admissions.

- Students create and internalise productive work habits, especially the organisational and workflow skills required to work on a team and find applicable answers.
- After gaining the knowledge, awareness and skills from a project-based lesson, students can almost always apply their learnings to a great range of settings, like other subject areas.
- There is a significant increase in students' motivation and self-esteem by working in team settings. Students who had lower drive in the classroom started to speak up and do so confidently (Swartz, 2020).

As educators adopt new pedagogical approaches to prepare students for the future, the 'what' that students must know has transformed. One of the features of the change in curriculum is that the emphasis has moved away from knowledge content to focus on the process, the higher order thinking skills and learning to learn.

b. Research Question (s)

The main question guiding this research paper is: How effective is project-based learning on students' 21st century higher order skills? Of which, the following sub-research questions can be derived:

- How effective is PBL on student's problem-solving?
- How effective is PBL on student's decision-making?
- How effective is PBL on student's collaborative working?

The rationale of the study is that students acquire and develop 21st century skills and abilities more so within a project-based learning class, in contrast to a regular curriculum class, particularly problem-solving, decision-making and collaborative working with peers. Because PBL practices and methods are so varied, it can be hard to determine what their actual value might be. So to better understand the PBL process, I investigated how the use of PBL is conducted within a regular school curriculum and the effectiveness of these higher order skills.

There is an association between the variables of the effectiveness of PBL on students' 21st century skills, with causes and effects. The effectiveness of PBL is the independent variable, or the cause, and the student's 21st century skills is the dependent variable, or the effect.

As Shona McCombes (2019) states, “In academic research, hypotheses are more commonly phrased in terms of correlations or effects, where you directly state the predicted relationship between variables.”

Accordingly, the hypothesis predicts that project-based learning will have a positive effect on students’ 21st century higher order skills. The null hypothesis (H_0) is that PBL has no effect on students’ 21st century higher order skills.

II. Literature Review

What is PBL?

Project-Based Learning (PBL) is a teaching method in which students learn by actively engaging in real-world and personally meaningful projects. Students work on a project over an extended period of time that engages them in solving a real-world problem, in which they demonstrate their knowledge and skills by creating a public product or presentation for a real audience. As a result, students develop deep content knowledge as well as critical thinking, collaboration, creativity, and communication skills, and teachers make learning come alive for students (pblworks, nd).

The PBL process is portrayed in more detail in figure 1 below (AECS, nd).

Figure 1

PBL: A Dynamic Approach to Teaching and Learning



Project-based learning is a systematic approach rooted in the theory of social constructivism of Vygotsky, the democratic learning of Freire and the experiential learning concepts of Kolb and has become one of the most popular approaches among EFL (English as a Foreign Language) teachers. In order to provide a change from the traditional teacher-centred approach to a student-centred approach, schools have incorporated PBL into every EFL class, as the students can integrate their language skills acquired from using PBL with other content subjects taught in English and ultimately be prepared for the 21st century skills (Wimolmas, 2018).

Educational research states that activating prior knowledge helps students to relate new information to existing knowledge, leading to richer knowledge structures. In fact, social constructivism advocates that individuals learn naturally when they are engaged in solving problems that concern them (Carrió, Rodríguez & Baños, 2020).

PBL emphasises meaningful learning activities that are long-term, interdisciplinary, and student-centred. The learning activities are designed to provide students with real world relevance, complex tasks, and creative outcomes. In the words of Papert (2011), “creating is learning”, which means the way to use knowledge is the way to get more knowledge. This can happen by creating projects such as movies, robots, inventions, multimedia, digital storytelling, etc. in the classroom environment (Soparat, Arnold & Klaysom, 2015).

Benefits of PBL

Project-based learning is a teaching method that taps into students’ interests because it allows them to create projects that result in meaningful learning experiences. Railsback (2002) has identified a number of important benefits of project-based learning: it is active not passive; it is interesting and relevant to the student; it allows for autonomy and self-directed learning; it increases communication skills; and it enhances motivation to learn. Increasingly, teachers and schools across the US are beginning to use this method because they know it engages and motivates students to learn (Wurdinger et al, 2007).

If implemented appropriately, the PBL approach can effectively solve the problems of inefficiency in English language teaching and learning. It gives learners the opportunity to successfully develop other skills, such as thinking skills and cooperative skills; and it has a positive effect on the motivation of learners compared with the traditional teacher-centred approach. Zhou (2012) and Taddei (2013) pointed out that PBL promotes learners’ creativity and the habit of lifelong learning.

In addition, PBL creates learner’s enjoyment and increases their positive attitudes (Wimolmas, 2018).

Challenges of PBL

Despite the positive benefits, PBL has some challenges concerning time and resource constraints, problems with group work and classroom disorder, and difficulty with incorporating technology into the project.

The challenge of the attitudes and beliefs of teachers and learners can create anxiety and resistance for teachers, and pressure for students to adapt themselves to an unfamiliar student-centred approach (Wimolmas, 2018).

Influence of PBL on student's problem-solving and decision-making

According to Meyer & Wurdinger (2016), problem solving is a vital element in project-based learning and stems from a constructivist concept.

Projects are the catalysts that initiate the planning, testing, and reflecting phases, and as students design and build their projects they must solve problems that arise. For instance, when a group of students are assigned to write and perform a puppet show they must solve multiple problems such as writing and editing a story line, designing and making puppets, and building appropriate props. A better project is created when students engage in problem solving through a trial and error process (Wurdinger et al, 2007).

Influence of PBL on student collaboration

Collaboration is an important classroom skill that is developed through PBL. According to Fullan and Scott (2014), collaboration refers to the ability to work independently and in teams. There is an emphasis on “strong interpersonal and team-related skills including effective management of team dynamics, making substantive decisions together, and learning from and contributing to the learning of others”.

Students considered that working with peers helped them to analyse different perspectives, integrate different points of view, and build on each other's ideas to reach the solution of the problem presented (Carrió, Rodríguez & Baños, 2020).

Students' perceptions of PBL and their life skills

A study by Fatmawati (2018) shows students' perceptions of 21st century skills development through PBL. The responses show that most of student's problem solving skills improve after the implementation of project based learning.

Data from research indicates that students are learning important life skills and perceive that they are improving various life skills while attending project-based learning schools. 50.18% of students from schools perceived improvement in their life skills as good, and 27.47% of students perceived their improvement in their life skills as excellent. Only 1.465% of students perceived their improvement of life skills as poor. This provides insights into how satisfied students feel about their life skills while attending these schools (Meyer & Wurdinger, 2016).

Project-Based Learning or Problem-Based Learning

The acronym PBL can refer to both project-based learning and problem-based learning. Even though the two terms may share some features about their attempts to encourage the students to be active learners, there are distinctive elements which make one different from the other.

Generally, the goal of project-based learning is the outcome, the product or the performance derived from the problem-solving process. In contrast, the focus of problem-based learning is particularly on the problem solving process itself (Wongdaeng & Hajihama, 2018).

III. Research Design

a. Description of Participants of the Study

i. Demographic Information

For this research, two groups of participants were selected – students and teachers. The demographic of the students sampled were Grade 6 (11-12 year olds), enrolled in a private all-girl school in Bangkok, Thailand. There was little diversity between the students, all of Asian ethnicity, with a small percentage being mixed-race students (Thai and European, Indian, South Korean or Japanese). Some of the students board on the school premises, with the remainder of students living in various areas of Bangkok, or neighbouring provinces. The students mostly came from advantaged backgrounds, with the parents having their own business or respected jobs, and the students having good morals and ethics fostered by the school.

Thirty English Program (EP) learners were purposively chosen from Grade 6 for the student questionnaire. There were no inclusion or exclusion criteria, however, the selection was based upon students who were reliable and responsible to get an informed response. All participants had their parent's permission (see Appendix A for the Parent Consent Form) and completed the questionnaire under teacher supervision. The sample size of the study is believed to be adequate for statistical analysis. As Nunan and Bailey (2009) suggests, if the data is to be analysed quantitatively, the number of subjects should be at least thirty and the more the better. Thus, the data from the participants can lend itself to be analysed both qualitatively and quantitatively.

With regard to the qualitative research, three PBL teachers and one PBL coordinator were selected for interview (see Appendix B for the Teacher Consent Form). There were no inclusion or exclusion criteria, merely that the teachers were chosen as to who was willing to participate in this study, who had the time in their schedules and who had experience of PBL. The teachers selected were Maths and Science teachers who also taught PBL to their classes, whereas the PBL coordinator was part of the EP's administration department and who was also a Maths teacher. Age, gender, ethnicity and backgrounds varied.

ii. Sampling Method

In Grade 6 there are approximately ninety students who study PBL. In this study, thirty students were chosen, by way of a hybrid of judgmental and convenience sampling techniques.

Judgmental sampling is a sampling technique in which the sample members are chosen only on the basis of the researcher's knowledge and judgment, and that the results obtained will be highly accurate with a minimum margin of error. Judgmental sampling is most effective in situations where there are only a restricted number of people in a population who own qualities that a researcher expects from the target population (QuestionPro, nd).

Convenience sampling is when researchers leverage individuals that can be identified and approached with as little effort as possible. These are often individuals that are geographically close to the researcher (Alchemer, 2021).

The justification for using these techniques was that I wanted to get sufficient and appropriate responses to the students' experiences, and that there would many different views.

b. Data Collection Tools/Materials

As discussed previously, the aim of this action research paper is to investigate the effectiveness of project-based learning on students' 21st century higher order skills, notably problem-solving, decision-making and collaborative working with peers. According to Nunan and Bailey (2009), surveys in social inquiry especially in education fall among common elicitation techniques as they can help to find out about the respondents' attitudes, conditions, and opinions about something at a particular point of time. Therefore, a student questionnaire and semi-structured teacher interviews were utilised in this study to obtain relevant and appropriate information about the topic from the participants.

The data collection tool for the students was a short, one-page bespoke student questionnaire in which the students completed in a PBL class (see Appendix C for the Student Questionnaire).

The data collection method for the teachers and administration was by way of one-to-one semi-structured interviews, conducted on the school premises, as and when the staff were available (see Appendix D for the teacher interview schedule and Appendix E for the teacher interview questions).

A. Questionnaire

The student questionnaire contained six question items to which the respondents provided answers by marking a tick against the desirable selection on a Likert scale (see Appendix C for the Student Questionnaire). The six question items were devised solely by the researcher and sought to examine and explore students' perceptions on their problem solving, decision making, collaborative working with peers, and, specifically, whether:

- PBL is fun and enjoyable
- PBL was successful this year
- PBL helps me work closely with friends
- PBL helps me to solve problems better
- PBL helps me to make decisions quicker
- PBL helps me to learn new skills

On the questionnaire, the data collection was visualised using a five-point Likert scale. A Likert scale, named after American psychologist Rensis Likert, measures a response to a close-ended question on a rating scale of how much you agree or disagree, often with a neutral option in-between. A typical five-point scale may include answers: strongly disagree, disagree, neither agree nor disagree, agree, strongly agree (Pirrone, 2020).

B. Semi-structured Interviews

Semi-structured teacher interviews can elicit both qualitative and quantitative data. The interview responses provided more detailed reasoning about the students' perceptions to PBL arising from the student questionnaire. The school has a total of seven PBL teachers and three administrative staff, however three PBL teachers and one PBL coordinator were specifically selected for an interview. They were aged between 20 and 40 years old, with at least five years teaching experience. They were selected not only for their expertise and knowledge in project-based learning, but also for their availability during the Covid-19 pandemic.

For the teacher data collection, the interview questions were considered on the effectiveness of PBL on students' problem solving, decision making and collaborative working skills (See Appendix E for the teacher interview questions). Some of the questions could be quantified using a Likert scale (see Section A above), whereas others were more subjective and individual, hence the interviews being semi-structured.

c. Data Collection Procedure

In this study, both qualitative and quantitative data was obtained. It was decided that data and facts, rather than subjectivity, was most suitable and effective for the student responses. Yet, I also required specific personal insight and views on PBL, so I chose qualitative data from colleagues and school administration.

The student questionnaire brought about the numerical data that would signify the students' perspectives of their experiences and successes in PBL, particularly towards the effectiveness of PBL on their problem solving, decision making and collaboration skills. The questionnaire also revealed the student's attitudes towards PBL in general and their motivation to learn new skills. It was both easy to understand and quick to complete by the students, and for the collection of data, it was convenient and timely.

Meanwhile, the teacher interviews led to views and opinions on the effect of PBL on students' skills within their regular subject classes. They shed more light on the reasons underlying the student responses to the questionnaire, as well as the overall success of project-based learning.

The procedure of data collection from students and teachers alike could easily be replicated in the future.

i. Student Questionnaire

As the participants of the questionnaire were of 12 years old, a parent consent form (see Appendix A) was sent out to households prior to the sampling. Once the consent forms were returned, the researcher could decide on who to survey. The study called for appropriate and personal responses, therefore some judgmental and convenient sampling techniques were undertaken in order to achieve the required sampling size of thirty students..

Participants were given an explanation of the survey goals and a brief description of the study itself. The questionnaire was conducted during a PBL class, in March 2021, and the participants placed a tick to indicate their response. The collected data was tallied, and a descriptive data analysis was made, as outlined in Section IV below.

ii. Teacher Interviews

For the teacher data collection, teacher interviews were organised during March 2021, when teachers were allowed back into school after the pandemic lockdown. Due to the workloads of all the participants and demands from school management, along with social distancing, it was quite difficult to coordinate and plan the interviews. Consequently, only a short amount of time could be taken for each interview. Nevertheless, four colleagues were cooperative and fully supported this study. The interviews were carried out during the teacher's free periods or at the end of the day when classes had finished.

Prior to the interviews, we discussed the purpose of my study and the data research to obtain the teacher's agreement (See Appendix B for the teacher consent form) and issued them with a paper copy of the interview outline. The teachers then prepared their responses to effectively utilise the time we had arranged. The interviews were semi-structured so that at each question we could discuss the reply, and further questions could be asked of the participant for clearer understanding and clarification.

IV. Data Analysis & Presentation of Results & Findings

a. Data Analysis

Due to the worldwide COVID-19 pandemic affecting education and students not being able to be in school for on-campus learning, it was initially somewhat difficult to obtain sufficient student and teacher responses. Nevertheless, the school did open for one month and all appropriate data were received and analysed as such. Data were analysed both quantitatively and qualitatively.

The students responded to the questionnaire by marking a tick on the five-point Likert scale to indicate their perspective, and the collected data was tallied and tabulated (see Appendix F for the core data).

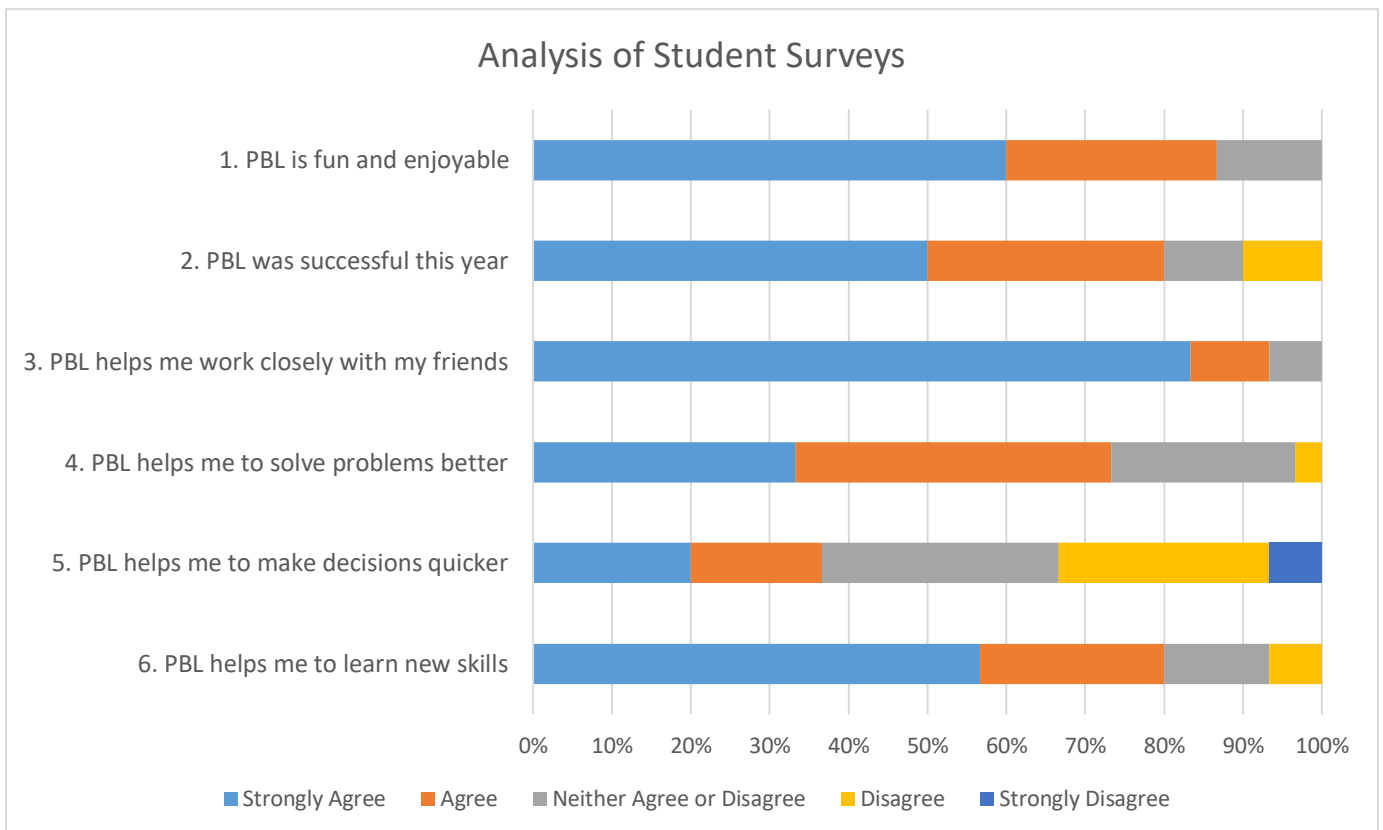
Such descriptive data analysis could provide an answer to the primary research question of the effectiveness of PBL on students' 21st century higher order skills. In addition, the responses from the questionnaire could respond to the secondary research questions about the perceived effects of PBL on students' problem-solving, decision-making and collaborative working. The data and responses collected from the teacher interviews were also valuable to this study.

b. Results & Findings

i. Student Survey Results

After the completion of the student surveys, the data from the students were collected and the responses are presented in Chart 1 below (see Appendix F for the core data).

Chart 1: Analysis of the student surveys



It can be observed that the majority of the students had positive attitudes towards project-based learning with more than 80% agreeing, or strongly agreeing, that PBL is fun and enjoyable.

When students experience their schoolwork to be fun and enjoyable, it tends to show that they are successful also. This can correlate to question two of the survey where the chart shows that only 10% of the students considered PBL not to be successful. However, those students may have differing reasons as to why they answered this, such as the schools' strict COVID-19 controls and working safe-distanced from their friends.

For the sub-research question, 'How effective is PBL on student's collaborative working?', the students perceived that teamwork and collaboration were the most beneficial aspects of PBL. 83% strongly agreed PBL helped them to work more closely with friends; having a chance to lead and manage their peers could be a highly positive factor.

For 'How effective is PBL on student's problem solving?', responses show that an overwhelming twenty-nine students agreed that PBL helped them to solve problems better.

It should be noted that less than 40% of students thought that PBL helped them to make decisions quicker. This low response could possibly be due to students not appreciating the distinction between making decisions and making decisions quicker.

On a positive note, the majority of students felt that PBL helped them to learn new skills; necessary in order to be a successful student and individual in the 21st century.

ii. Teacher Interview Results

In March 2021, four individual interviews were conducted with PBL teachers to gather more in-depth information on student engagement. They were asked five questions summarised below.

1. What grade/s do you teach PBL to?
2. Please rate how successful your PBL was this year. (Or last year due to COVID-19 pandemic).
3. Briefly explain your understanding as to why the PBL was that outcome?
4. On a scale of 1 – 5, rate the students in your normal classes on the following criteria:
 - a) Problem solving skills:
 - b) Decision making skills:
 - c) Collaborative working:
5. From your experience, how effective is PBL on a student's problem solving, decision making, and collaborative working skills? (Rating from 1 being Not Effective to 5 being Very Effective).

The interviews were semi-structured in that notes were taken, together with follow-up enquiries, to gather information deemed important to the study. Hence, all of the information could support or rationalise the findings from the student questionnaire and to elaborate on them.

Responses from the teachers are presented in Table 1 on the next page.

Table 1: Responses from the teacher interviews

Question	Teacher			
	A	B	C	D
1	G1-2	G4	G1-9 (Coordinator)	G7
2	Very successful	Very successful	Very successful	Successful
3	See below for individual teacher responses			
4				
a.	5	5	n/a	5
b.	5	4	n/a	4
c.	4	5	n/a	5
5	5	5	5	5
	See below for individual teacher responses			

Question 3

All of the teachers who were interviewed commented on this year’s PBL rather than last years as it was the most recent. The teachers felt very satisfied that PBL was completed and that it was very successful for the teachers and students alike, considering the academic year was affected by COVID-19 and the school was closed. However, it was acknowledged that maybe PBL could have been viewed as only successful from a school perspective, rather than very successful, due to not meeting the schools’ expectations, and the final product being achieved over performance.

Some quoted examples included:

“Students learnt from the process, rather than the end product.”

“Students felt it was relevant and interesting to the real-world problem and were highly motivated to make it successful.”

“We didn’t have a lot of time or resources as I would have liked this year, but I recognise the importance of students being engaged and motivated to make the lessons fun, and the projects were very creative and innovative.”

Question 5

From observations in their PBL and subject classes, the teachers reported unanimously that project-based learning was highly effective in students' problem solving, decision making, and collaborative working skills. Opinions offered included:

“Students take their PBL experiences into my Science classes organically.”

“Problem-solving skills are being applied all the time when they are working on solutions to the Maths exercises.”

“Some students are now less shy to work with their friends and can ask and answer questions better after gaining more confidence in PBL. Most students have become more vocal in the classroom and they realise that working together they can finish the work quicker and understand it more.”

“Overall, I think PBL benefits students a lot and I can see them working well together in my classroom. I am not sure though how much PBL actually helps the students solve problems and make decisions better.”

V. Conclusion, Implications and Recommendations for Improvement/Future Research

a. Discussion/Implications

i. Main Results and Findings

From the main results and findings, it was perceived that students learn 21st century higher order skills more so within a PBL class than in a regular class. Approximately three-quarters of students responded positively to PBL helping them work more closely with friends, solve problems better and to make decisions quicker. Furthermore, over 82% had a positive PBL experience and to learning new skills.

ii. Discuss Implications

Students acquire, develop and apply new life skills that they would not normally gain in a regular class. The implications are that students become more competent and confident within themselves, better equipped to deal with future challenges, and become valued members of the community as the next generation of employers and leaders.

b. Evaluation: Strengths/Limitations

A limitation to this study could be that the sampling, as described in Section III.a.i., was slightly biased as the students were purposively selected. Also, the study's aim was to realise the effectiveness of PBL on students' 21st century higher order thinking skills. However, to the extent how this can be measurably assessed makes the findings relatively limited in terms of how PBL correlates to improvement in these skills and students grades.

The strength of the study is that it highlights the students' perceptions of how effective PBL is on improving their higher order thinking skills and relating them to the curriculum.

c. Recommendations for Improvement

Arising from the limitations, there are certain recommendations for improvement to the study. Whilst a third of the year group were sampled, it may be prudent to survey half of the classes, or even additional classes in different year groups, by random sampling techniques. However, this may not be time-efficient with no assurances of authentic or reasonable responses.

Another recommendation would be to observe PBL and regular classes, if more time and resources were afforded, to provide further evidence that 21st century higher order skills benefit students tangibly in the classroom.

d. Future Research Questions

The current study focuses on students' perception of PBL (towards their higher order thinking skills) rather than assessing if PBL is effective on the target skills. Therefore, further research should be carried out on how to accurately evaluate the effectiveness of PBL on students' 21st century skills, which could further validate the results of the research.

e. Conclusion

It can be concluded that project-based learning is extremely effective on students' 21st century higher order thinking skills. Findings from the student questionnaire and teacher interviews confirm students are highly engaged and motivated in PBL, in which they solve problems better, make decisions quicker and work more closely with their friends, along with learning new skills, whilst working on their projects. Students in PBL classrooms are spending more time learning about important content through experiences that emphasise critical thinking, collaboration, creativity, and communication.

These higher order skills, nurtured through PBL, benefit students within their own classrooms, developing them into confident, knowledgeable and guiding individuals in the 21st century educational landscape. Therefore, PBL is an especially important addition to the school's curriculum.

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VII. Appendices

Appendix A: Parent's Consent Form

**Parental Consent Form
Participation in an Action Research Paper**

Dear Parent/Guardian,

I am undertaking a Master's in Education and to complete the degree I need to conduct a survey of students for the final action research paper. The purpose of this research is to investigate how effective Project Based Learning (PBL) is on a student's problem-solving, decision-making and collaborative working. I hope this information will help suggest ways that our school and its' teachers can support and improve the student's education in the future.

I am writing to ask if you would be willing to give permission for me to ask your daughter if she would like to take part in my research.

It would involve either completing a short questionnaire, or a quick interview, in order to find out how PBL is helping her in her subjects. The questionnaire or interview will take place in school during a break time and will take approximately five minutes to complete. Your daughter's participation in this research will be treated confidentially and all information will be kept anonymously, meaning that no one will be able to work out what she has written or said.

If you have any comments or questions about this research please contact the Thai Homeroom Advisor, or the Head of the English Program.

Many thanks in advance for your consideration of this research paper. Please let me know if you need more information. I would appreciate it if you could complete the attached permission slip and return it to me by your daughter.

Kind regards,

Mr. Peter Rutt
Grade 6 PBL Teacher

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I, _____ (NAME) consent to Mr. Peter Rutt proceeding with this research.

Signature of Parent or Guardian: _____ Date: _____

Name of Student: _____

Appendix B: Teacher's Consent Form

Teacher Consent Form Participation in an Action Research Paper

Title of Thesis: Project Based Learning.

Description of the research and participation

You are invited to participate in a research study conducted by Peter Rutt. The purpose of this research is to investigate how effective Project Based Learning (PBL) is on a student's problem-solving, decision-making and collaborative working.

If a participant wishes to withdraw from participation at any time, that decision will be respected. Your participation will involve an interview. It will take a maximum of 30 minutes to complete.

Risks and discomforts

There are no known risks associated with this research. Participants may experience some anxiety in answering the questions, but the researcher will reassure participants that information will be confidential, and any data collected will only be used for investigating the aim of the study.

Potential benefits

As a teacher of PBL, there may be benefits to you of the result from your participation in this research. This research will help me to understand the effect of PBL on a student's 21st Century skills.

Protection of confidentiality

Data collection during the research process will be kept confidential. I will do everything I can to protect your privacy. Your identity will not be revealed in any publication resulting from this study.

Voluntary participation

Your participation in this research study is voluntary. You may choose not to participate, and you may withdraw your consent to participate at any time. You will not be penalized in any way should you decide not to participate or to withdraw from this study.

Contact information

If you have any questions or concerns about this study or if any problems arise, please contact me at school. Alternatively, you may contact your Head of Department or the Director of the English Program.

Consent

As a participant, I have read this consent form, understand the information contained in it and have been provided with the opportunity to ask questions. I agree to the terms. I hereby give my assent to participate in this study.

Participant's name _____

Participant's signature _____ Date: _____

Researcher's signature _____ Date: _____

Appendix C: Student Questionnaire

Questionnaire on Project Based Learning

Introduction: Project Based Learning (PBL) is a teaching method in which students learn by actively engaging in real-world and personally meaningful projects. Students learning in PBL will acquire 21st century skills in order for them, and the projects, to be successful. Skills, such as thinking critically to solve problems, making decisions, and working well with others.

Thinking about your PBL lessons, how much do you agree or disagree with the following? For each statement please tick (✓) the appropriate box. This questionnaire should only take a maximum of five minutes to complete.

Question	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
1. PBL is fun and enjoyable					
2. PBL was successful this year					
3. PBL helps me work closely with my friends					
4. PBL helps me to solve problems better					
5. PBL helps me to make decisions quicker					
6. PBL helps me to learn new skills					

Thank you very much for taking your time to complete this questionnaire.

Mr. Peter

Grade 6 PBL Teacher

Appendix D: Teacher Interview Schedule

Action Research Paper – Project Based Learning

The aim and objective of my study is to find out how effective Project Based Learning is on a student's problem-solving, decision-making and collaborative working skills.

Interview Schedule

Teacher A: March 4th, 2021 @ 2 p.m.

Teacher B: March 5th, 2021 @ 2 p.m.

Teacher C: March 11th, 2021 @ 2 p.m.

Teacher D: March 12th, 2021 @ 2 p.m.

Appendix E: Teacher Interview Questions

PBL (Project Based Learning) Research Paper

Teacher interview questions on the effectiveness of PBL on students' problem-solving, decision-making, and collaborative working skills.

Introduction: Project Based Learning is a teaching method in which students learn by actively engaging in real-world and personally meaningful projects. Students learning in PBL will acquire 21st century skills in order for them, and the projects, to be successful. Skills, such as thinking critically to solve problems, making decisions, and working well with others.

- 1) What grade/s do you teach PBL to?
- 2) Please rate how successful your PBL was this year. (Or last year due to the COVID-19 pandemic).

Not Successful	Poor	Adequate	Successful	Very Successful
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- 3) Based upon your ratings in the previous question, briefly explain your understanding as to why the PBL was that outcome?
- 4) On a scale of 1 – 5, please rate, on average, the students in your normal classes, not PBL, on the following criteria. 1 being the lowest rating, and 5 being the highest rating.
 - a) Problem-solving skills:
 - b) Decision-making skills:
 - c) Collaborative working:
- 5) Students don't learn the above 21st century skills in the core subject matter of a traditional curriculum. From your experience, how effective is PBL on a student's problem-solving, decision-making, and collaborative working skills?
(You can rate with 1 being Not Effective to 5 being Very Effective, with your opinion).

Appendix F: Student Questionnaire Core Data

Responses to the student survey

Question	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
1. PBL is fun and enjoyable	18	8	4	-	-
2. PBL was successful this year	15	9	3	3	-
3. PBL helps me work closely with my friends	25	3	2	-	-
4. PBL helps me to solve problems better	10	12	7	1	-
5. PBL helps me to make decisions quicker	6	5	9	8	2
6. PBL helps me to learn new skills	17	7	4	2	-