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A Case Study of Culturally Responsive Evaluation

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Abstract

This study applied a culturally responsive evaluation (CRE) to assess the impact of a multidisciplinary project-based learning(MdPjBL) program on students in two junior high schools with different cultures and contexts. Case A was located in an urban area, and the participants included five teachers acting as evaluators and 93 eighth graders, with 49 and 44 assigned to the experimental and control groups, respectively. Case B was located in an aboriginal area and included three teachers and 17 eighth graders as participants. This study used a mixed research design, applying the following approaches to collect data during program implementation: Critical Thinking Scale, Communication Scale, Creativity Scale, Collaboration Scale, Problem-solving Scale, Technological Application Scale, and students' project work outcomes. The findings indicated that (1) compared with traditional pedagogy, MdPjBL pedagogy positively impacted students' capacities for 5Cs and technology application; (2) based on post-test results, MdPjBL pedagogy had a more positive impact on students' capacities for 5Cs and technology application than traditional pedagogy; and (3) cultural differences among students led to different visual styles, storylines, and ways of conveying project research outcomes.

Keywords: culturally responsive evaluation, multidisciplinary project-based learning, program evaluation

1. Introduction

Over the past decade, evaluators have realized the impact of culture and context on all programs, making cultural concerns a central evaluation issue (Hood et al., 2015; Thomas, 2011). Culture broadly refers to a cumulative body accumulated by the behaviors, shared values, customs, and beliefs of a particular ethnic group or society (Frierson et al., 2002). Thomas and Parsons (2017) stated that culture is an intersubjective reality in which an individual's attitudes, motivations, and behaviors are influenced by what he or she knows,

creates, and experiences. Context is a complex phenomenon characterized by multidimensional and multi-partial characteristics, such as the demographics of program participants, the geographical location of program implementation, the physical environment, the economic situation, the history of the institution, the organizational climate, and the political atmosphere surrounding it (Chouinard & Cousins, 2009; Greene, 2005).

To cope with the plurality of cultural and background contexts, evaluation theory and practice have emphasized the importance of culturally responsive evaluation (CRE). The rise of CRE due to multicultural education in the United States in the late ’60s and early ’70s of the 20th century is closely related. Both stem from critical race theory, which emphasizes the awareness of racial consciousness and the realization of racial fairness and justice; it also advocates exposing the unfair experience suffered by ethnic minorities from the social system to arouse the racist consciousness of mainstream ethnic groups and promote equal relations between different ethnic group (Thomas, 2009). The core concept of multicultural education is not to require ethnic minorities to abandon their cultural traditions and integrate or assimilate into the mainstream social culture but to respect each other with the goal of harmonious social coexistence. In this way, ethnic minority students can enjoy the same treatment as most students without discrimination based on race, social class or gender, and achieve the ideal of equal educational opportunities (Banks, 2001).

CRE also pays attention to the potential impact of culture, ensures that the voices of disadvantaged groups are heard, exerts the influence of evaluation results, and enhances social fairness and justice. CRE examines the impact of cultural context on the program, providing opportunities for the voices of key stakeholders, especially the underprivileged, to be heard, so that the evaluation process and results can be more diverse (Greene, 2006; Thomas & Parsons, 2017).

Evaluation models on culture, context, pluralism, and inclusiveness have sprung up, such as culturally responsive, cultural literacy, multicultural, and cross-cultural evaluation (Chouinard & Cousins, 2009; Samuels & Ryan, 2011). These models focus on the impact of various cultures and contexts from the perspective that social institutions and structures cannot be separated from them (Hopson, 2009). It is believed that the conceptualization, design, implementation, and evaluation of programs should be aware of and consider the diverse historical, cultural, political, and economic contexts and that if the cultural entities of the target population are not responsive or ignore their influence, it would easily lead to ineffective solutions, lack of sound evaluative results, and even potentially devastating consequences (Frierson et al., 2002).

Similar to other evaluation models, the evaluation steps of CRE include making preparation before departure, identifying stakeholders, establishing evaluation purpose and intention, defining evaluation issues and scope, designing evaluation process, selecting the evaluation tools, collecting and analyzing the evaluation data, applying and promoting evaluation results (Frierson et al., 2002). However, during the evaluation process, the CRE team must be physically present and immersed as much as possible in the cultural context of the project to gain insight into the impact of culture on program participants. In addition, the team also

needs to include people who have lived with the group in order to have a deep understanding of the context, practices, and mindset of the culture. Evaluation is a learning process. Evaluators should have a humble attitude, respect the differences between different cultures, have a deep understanding of the impact of social systems or mainstream culture on students of different cultures, and the evaluation results must consider the multicultural perspective and report the evaluation results of various stakeholders' concerns before making reasonable decisions (AEA, 2011; Yu et al., 2017).

Many studies have pointed out that traditional teaching methods are no longer suitable for the needs of future school education. Future education should emphasize multidisciplinary project inquiry, be task-oriented, and guide students to ask questions by collaborating and applying technology, creativity, and innovation. The learning programs should combine inside and outside the school to effectively cultivate students' ability to cope with the future effectively (Harper, 2014; Kokotsaki et al., 2016). All multidisciplinary can integrate relevant knowledge and experience through a project-based learning approach to produce more meaningful learning (Drake & Burns, 2004). In other words, multidisciplinary project-based learning (MdPjBL) breaks down the barriers of disciplines so that the knowledge of different disciplines can be constructed with each other under project inquiry, generating links and forming meaningful learning.

According to Appleby (2021), MdPjBL has the following advantages. (1) the learning content is related to life experience, provides a real purpose for learning, promotes students' active participation, and cultivates students' communication and teamwork skills. (2) Exploring project from different perspectives can develop students' critical thinking skills. (3) Acquiring new knowledge from multiple perspectives can cultivate students’ creativity, motivate them to pursue new knowledge in different subject areas, and cultivate their problem-solving skills. Many studies also confirmed that MdPjBL develops positive learning attitudes and is an effective way to cultivate students' ability to have capabilities for critical thinking, communication skills, creativity, collaboration, complex problem-solving(5Cs), and technology application (Bell, 2010; Tamim & Grant, 2013).

Therefore, this study invited two junior high schools—one is located in an aboriginal area, and the other is located in an urban area area—involved in MdPjBLP teaching and applied CRE to assess the impact of this program on students in both schools. To enable teachers who are designers and implementers of MdPjBLP to have the ability to evaluate the program through CRE during experimental teaching, this study equipped team teachers to have evaluative thinking, cultural competency, and evaluative capacity through workshops before implementing the program. The research questions of this study were as follows: 1) Does MdPjBL pedagogy have a more positive impact than traditional pedagogy on students' abilities for 5Cs and technology application? 2) Does the MdPjBL pedagogy implemented in schools with different cultural contexts, positively impact students' abilities for 5Cs and technology application? 3) Does the cultural context of the school impact students' project research outcomes?

2. Methods

2.1 Description of Cases and Student Participants

Case A is located in an urban area with over 20 classes and more than 500 students. This school has relatively high academic performance requirements for students due to a culture of academic emphasis. Teachers are committed to providing high-quality teaching and make efforts to motivate students to learn and encourage them to achieve academically. However, this school also places great emphasis on nurturing the holistic development of its students, including education in arts, sports, humanistic literacy, and other aspects, aiming to cultivate students' diverse talents and interests. The school often encourages its' students to participate in school activities and school affairs, exert initiative and participate in school management and decision-making. The school actively promotes international education, by offering courses or exchange activities to allow students to contact different cultures and expand their international perspectives. The 93 students participating in this program were eighth graders (49 in the experimental group and 44 people in the control group).

Case B is located in the aboriginal area and has three classes and fewer than 80 students. The area is known for its beautiful natural landscapes. The school emphasizes environmental protection and natural care, encourages students to pay attention to environmental protection issues, and advocates the value of protecting ecological balance. Because of the gathering places of ethnic minorities, the school attaches importance to the inheritance and promotion of ethnic culture, encourages students to respect multiculturalism, enhances cultural exchanges and understanding, emphasizes local characteristics, incorporates local culture and history into the educational curriculum. The school also works closely with the local community, encourages students to participate in community services and activities, and cultivates students' sense of social responsibility. Because this school is a remote school that provides a dormitory for students with a lot of communication and interaction between teachers and students, it also provides counseling, psychological counseling, and other support measures to help students face growth challenges. Seventeen eighth graders are participating in this program.

The cultures and contexts of Case A and B can be pretty distinct due to their different environments, populations, and historical backgrounds. Some of the key differences in culture and context between these two schools include the students' population, access to resources, teacher qualifications, and cultural diversity. For examples, First, students' population: Case A typically has a diverse student population representing various ethnicities, cultures, and socioeconomic backgrounds. This diversity often creates a multicultural environment; while whereas, Case B primarily includes indigenous students, creating a more homogenous cultural environment within the school. Second, Access to resources: Case A may have better access to educational resources, including technology, libraries, extracurricular activities, and a more comprehensive range of educational opportunities. Case B may face resource limitations, including inadequate funding, outdated materials, and challenges related to remote locations. Third, the teachers in Case A generally meet standard certification requirements and come from various cultural backgrounds. Some of the teachers

in Case B are inexperienced substitute teachers; however, some Indigenous educators can provide a culturally rich learning experience for the students. Fourth, students in Case A often are exposed to a wide range of cultures, which can foster cross-cultural understanding but in-depth cultural immersion may only sometimes occur. Case B is dedicated to preserving and revitalizing Indigenous cultures and languages, helping to counteract historical cultural assimilation efforts.

2.2 Description of MdPjBLP

In this study, MdPjBL pedagogy integrated CRE into the core concepts of natural science, inquiry ability, scientific attitude, cross-disciplinary knowledge, and skills from three learning fields: natural science, technology, and fine art. From the process of project inquiry, the teacher guided students to observe, plan, and explore; collaborate and practice in groups; conduct inductive analysis; apply critical thinking; perform interpersonal communication; show creativity and innovation; solve problems; and apply technology.

The primary teaching process of MdPjBL pedagogy includes (1) holding introductory events, which help students engage in exciting and innovative topic exploration; (2) assigning tasks, to make students proficient in monitoring their learning progress and using time effectively; (3) guidance and eagle scaffolding, to fill the gap in the students' knowledge and skills; (4) providing project resources or required expert consultation; (5) promoting more collaborative learning by setting goals and encouraging students to work collaboratively, complete the part for which they are responsible, and continue to complete the whole task; (6) allowing inquiry and innovation, in which students actively participate in the design, problem solving, decision making, and inquiry; (7) providing students with opportunities for reflection, feedback, and revision suggestions for their works; and (8) publicly presenting the project results to classmates, teachers, and authentic audiences outside the school to encourage students to care more about quality and render learning more meaningful (Buck Institute for Education, 2013).

The MdPjBL pedagogy in this study consisted of two project topics: "Exploration of Materials to Prevent Noise" and "Use of Recycled Resources to Create Ads that Reduce Use of Plastic Products." Of the 93 eighth-grade students in Case A, 49 were assigned to the experimental group and 44 to the control group. The experimental group received the MdPjBL pedagogy, while the control group students received the traditional pedagogy. In Case B, 17 eighth graders participated in the program and received the MdPjBL pedagogy.

2.3 Description of Evaluators and Evaluation Procedure

Based on Thomas's (2011) perspective, an understanding of the culture of those being evaluated is essential for a culturally responsive evaluation. Therefore, in selecting the evaluation team members, one should consider team members who should understand or at least have a clear commitment to respond to the cultural context in which the project is being implemented. Eight evaluators, including two principals and six teachers, participated in the culturally responsive evaluation of this study. The background information of the eight evaluators is shown in Table 1.

Table 1. Evaluators' Background Information

code	location of school	Position	Major	Gender	Seniority
TA1	Urban	principal	Nature science	M	29
TA2	Urban	teacher	Nature science	M	32
TA3	Urban	teacher	Nature science	M	22
TA4	Urban	teacher	Technology	M	12
TA5	Urban	teacher	Fine arts	F	24
TB1	Aboriginal	principal	Nature science	M	32
TB2	Aboriginal	teacher	Nature science	M	7
TB3	Aboriginal	teacher	Geography	F	13

Before conducting the evaluation, the participants used the online platform to engage in self-directed learning, online professional dialogue, and face-to-face CRE workshops. CRE workshops (about three hours each) were held monthly to integrate the knowledge concepts learned by teachers' self-directed learning to transform the theory of evaluation into practical knowledge. The topics of the CRE workshop were cultural self-awareness, the meaning and importance of CRE, and CRE evaluation strategies, such as data collection and analysis and interpretation of results.

During the evaluation process, the evaluation team held regular meetings according to the evaluation stage to understand the status of program implementation and to examine the analysis results of the data collection at each school.

2.4 Evaluation Instruments

This study used six scales as a tool of pre-test and post-test, including the Critical Thinking Scale, Communication Scale, Creativity Scale, Collaboration Scale, Problem-solving Scale, and Technological Application Scale. All of these Scales have good validity and reliability of the items within each scale. In addition, this study also collected students' inquiry works as a kind of data.

3. Results

3.1 Effectiveness of MdPjbLP Experimental Teaching in Case A

3.1.1 Comparison of Capacities for 5Cs and Technology Application between the Experimental Group and the Control Group in Case A

The participants in this study consisted of 46 experimental group students and 45 control group students. A one-factor covariance analysis was used to compare the differences between the experimental and control groups. The independent variable was pedagogy, and the dependent variables were the post-test overall scores for the capacities for 5Cs and technology application.

3.1.1.1 Homogeneity of Variance Test

Table 2 showed the results of Levene’s Test of Equal Variances, which showed that the p-value of the capacities for 5Cs and technology application did not reach a significant level

(p＞.05) indicating before treatment, the capacities for 5Cs and technology application of the experimental and control groups were homogeneous.

Table 2. Summary of Levene's Test of Equal Variances

Dependent Variable	*F*	*df* 1	*df* 2	*p*
creativity	3.23	1	91	.26
collaboration	2.15	1	91	.09
critical thinking	1.26	1	91	.31
communication	3.52	1	91	.06
problem-solving	2.72	1	91	.10
technology application	0.71	1	91	.40

3.1.1.2 Homogeneity of Regression Coefficients Test

Table 3 showed the results of the homogeneity of the regression coefficient test, which showed that the p-value did not reach a significant level (p ＞.05). Specifically, the regression slope was the same and did not violate the assumption of the homogeneity of the regression coefficient within the group, so it was appropriate to conduct a covariance analysis.

Table 3. Summary of the Homogeneity of the Regression Coefficients Test

Dependent Variable	Sources	*SS*	*df*	*MS*	*F*	*p*
creativity	treatment ×pre-test	1.16	1	1.16	2.32	.23
	error	44.48	89	0.50		
	sum	1191.02	93			
collaboration	treatment ×pre-test	1.61	1	1.61	3.23	.11
	error	44.41	89	0.50		
	sum	1119.70	93			
critical thinking	treatment × pre-test	1.00	1	1.00	2.50	.21
	error	35.69	89	0.40		
	sum	1266.61	93			
communication	treatment ×pre-test	1.39	1	1.39	2.80	.15
	error	44.20	89	0.50		
	sum	1264.22	93			
problem-solving	treatment ×pre-test	1.38	1	1.38	2.74	.15
	error	44.79	89	0.50		
	sum	1117.98	93			
technology application	treatment ×pre-test	0.97	1	0.97	2.31	.23
	error	37.14	89	0.42		
	sum	1251.99	93			

3.1.1.3 Analysis of One-way Covariance

Tables 4 and 5 show the results of the one-way covariance analysis. Table 5 indicated that significant differences existed in the abilities of creativity ($F = 4.57$, $\eta 2 = .15$, $p < .05$), collaboration ($F = 4.74$, $\eta 2 = .16$, $p < .05$), critical thinking ($F = 6.96$, $\eta 2 = .27$, $p < .01$), communication ($F = 7.42$, $\eta 2 = .30$, $p < .01$), and technology application ($F = 9.29$, $\eta 2 = .42$, $p < .01$) between the experimental and control groups. This result indicated that MdPjBL pedagogy more significantly impacted students' capacities for 5Cs and technology application than traditional pedagogy. However, the two groups had no significant difference in students' problem-solving abilities.

Table 4. Average of the Adjustment of the Pedagogy of Capacities for 5Cs and Technology Application Post-Test

Dependent Variable	Treatment	*M*	*SE*	95% CI	
				LL	UL
creativity	experimental	3.51	0.11	3.30	3.72
	control	3.48	0.11	3.26	3.71
collaboration	Experimental	3.39	0.11	3.18	3.61
	control	3.37	0.11	3.15	3.60
critical thinking	experimental	3.65	0.10	3.46	3.84
	control	3.60	0.10	3.40	3.80
communication	experimental	3.65	0.11	3.44	3.87
	control	3.55	0.12	3.32	3.78
problem-solving	experimental	3.45	0.11	3.23	3.67
	control	3.32	0.11	3.11	3.53
technology application	experimental	3.63	0.10	3.44	3.82
	control	3.59	0.10	3.39	3.79

Table 5. Summary Table of the One-Way Covariance Analysis of the Pedagogy of the Capacities for 5Cs and Technology Application Post-Test

Dependent Variable	Sources	*SS*	*df*	*MS*	*F*	η^2
creativity	treatment	2.52	1	2.52	4.57*	.15
	error	49.64	90	0.55		
	sum	1191.02	93			
collaboration	treatment	2.69	1	2.69	4.74*	.16
	error	51.03	90	0.58		
	sum	1119.70	93			
critical thinking	treatment	3.07	1	3.07	6.96**	.27
	error	39.69	90	0.44		

	sum	1266.61	93			
communication	treatment	4.25	1	4.25	7.42**	.30
	error	51.59	90	0.57		
	sum	1264.22	93			
problem-solving	treatment	3.40	1	3.40	6.22	.24
	error	49.17	90	0.55		
	sum	1117.98	93			
technology application	treatment	4.04	1	4.04	9.29**	.42
	error	39.11	90	0.44		
	sum	1251.99	93			

*$p < .05$. **$p < .01$.

3.1.2 Comparison of the Differences between the Pre-test and Post-test of the Experimental Group

The results of the paired t-test analysis shown in Table 6 indicated that the students' post-test scores in the scales of creativity (t = 3.55, p＜.01), collaboration (t = 2.40, p＜.05), critical thinking (t =2.51, p＜.05), communication (t = 2.43, p＜.05), problem-solving (t =2.72, p ＜.05), and technology application (t = 3.79, p＜.01) were significantly higher than their pre-test scores.

Table 6. Results of the Paired *t*-test for the Experimental Group to Measure Capacities for 5Cs and Technology Application in Case A

	Pre-test		Post-test		
Scale	*M*	*SD*	*M*	*SD*	*t*
creativity	3.43	0.82	3.78	0.73	3.55**
collaboration	3.28	1.02	3.56	0.75	2.40*
critical thinking	3.58	0.81	3.82	0.58	2.51*
communication	3.58	0.88	3.82	0.76	2.43*
problem-solving	3.30	0.75	3.58	0.88	2.72*
technology application	3.43	0.65	3.80	0.62	3.79**

*p<.05. **p<.01.

3.2 Effectiveness of MdPjBLP Experimental Teaching in Case B

3.2.1 Comparison of the Differences between the Pre-test and Post-test of the Experimental Group

The results of the paired t-test analysis shown in Table 7 indicated that the students' post-test scores in the scales of creativity (t = 1.98, p＜.05), collaboration (t = 2.06, p＜.05), critical thinking (t =2.41, p＜.05), communication (t = 3.89, p＜.01), problem-solving (t =2.33, p ＜.05), and technology application (t = 2.84, p＜.01) were significantly higher than their

pre-test scores.

Table 7. Results of the Paired *t*-test for the Experimental Group to Measure Capacities for 5Cs and Technology Application in Case B

	Pre-test		Post-test		
Scale	*M*	*SD*	*M*	*SD*	*t*
creativity	3.29	1.01	3.84	0.66	1.98*
collaboration	3.30	1.03	3.69	0.94	2.06*
critical thinking	3.35	1.08	3.86	0.96	2.41*
communication	3.43	1.05	3.64	0.84	3.89**
problem-solving	3.41	1.10	3.61	0.87	2.33*
technology application	3.33	.60	3.87	.63	2.84*

*p<.05. **p<.01.

3.3 Students' Project Research Works

3.3.1 Project 1: Exploration of Materials to Prevent Noise

The exploration of materials is crucial in the field of noise prevention and control. Noise pollution is a significant environmental and health concern, and selecting suitable materials for various applications can play a pivotal role in reducing noise levels. The exploration of materials is vital in preventing noise pollution because it allows for the developing of effective and sustainable solutions tailored to specific needs and circumstances. The right choice of materials can lead to a quieter, more comfortable, and healthier environment for individuals and communities while also addressing environmental and cost considerations. Therefore, "exploration of materials to prevent noise" was selected as one inquiry project of MdPjBLP pedagogy. Exhibits 1 and 2 show students' research works in Project 1 in Case A and B.

Exhibit 1. Examples of the Research Works of Project 1 in the Experimental Group of Case A



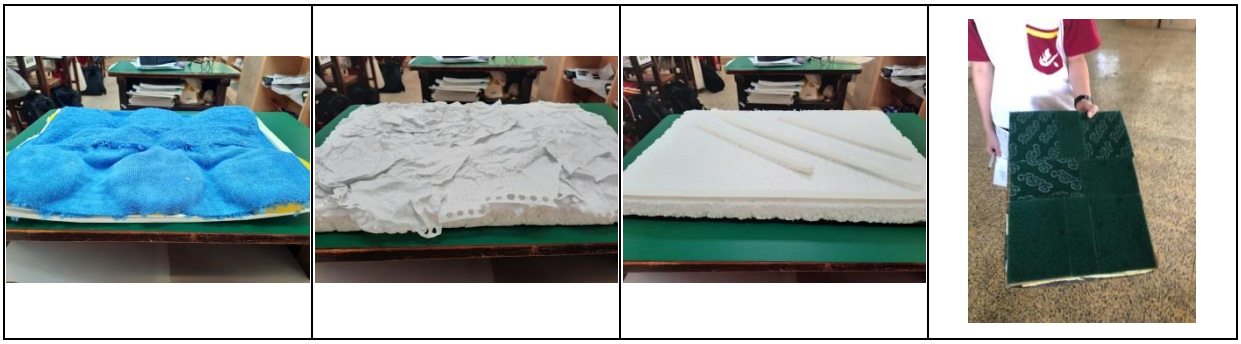
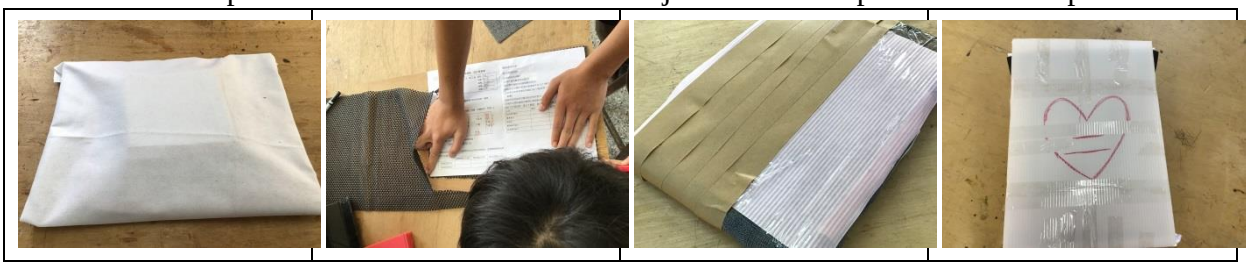



Exhibit 2. Examples of the Research Works of Project 1 in the Experimental Group of Case B



3.3.2 Project 2: Use Recycled Resources to Create Ads That Reduce the Use of Plastic Products

Using recycled resources could help conserve resources, reduce environmental impacts, save energy, create economic opportunities, and promote a sustainable and responsible approach to production and consumption. Incorporating recycling into everyday practices and supporting products made from recycled materials is a fundamental step in building a more sustainable and environmentally friendly future. Using recycled resources to create advertisements that advocate for reducing the use of plastic products is important for raising awareness, educating the public, promoting sustainable practices, and ultimately contributing to the global effort to mitigate plastic pollution and its harmful effects on the environment. It also aligns with the values of responsible and environmentally conscious businesses, which can enhance their reputation and success. Therefore, project "Use Recycled Resources to Create Ads That Reduce the Use of Plastic Products" was selected as one inquiry project of MdPjBLP pedagogy. Exhibit 3 and 4 show the students' research works in Project 2 in cases A and B.

Exhibit 3. Examples of the Research Works of Project 2 in the Experimental Group of Case A

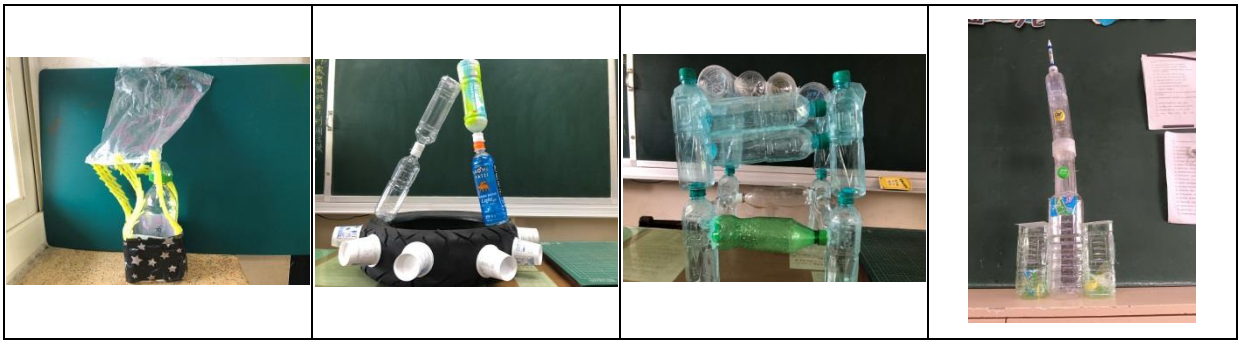


Exhibit 4. Examples of the Research Works of Project 2 in the Experimental Group of Case B

The findings showed that cultural differences between students from aboriginal areas and urban areas. Urban students' project works are more technical and creative, reflecting the diversity of works and attracting audiences from different backgrounds. By contrast, the works of students from the aboriginal area were simpler and more primitive, containing elements of native culture. However, students in both cases excelled in both the design and presentation phases, demonstrating the skills of collaboration, communication, creativity, and data gathering that would be important for their future learning and career development.

4. Discussion

The analysis of covariance of the experimental group and control group of Case A showed that students' capacities for creativity, collaboration, critical thinking, communication, and technology application were higher after receiving MdPjBL pedagogy than after receiving traditional pedagogy. Moreover, a comparison of pre-and post-tests of the experimental group in cases A and B showed that the post-test results were significantly higher than the pre-test results, indicating that MdPjBL pedagogy had a more positive impact on students' capacities for 5C and technology application than traditional pedagogy. These findings are similar to previous findings (Budiarti et al., 2021; Haniah et al., 2021; Tamim & Grant, 2013) and are likely to reflect be the differences in traditional and projected-based learning pedagogies.

In traditional pedagogy, the teacher plays a central role, and learning is typically teacher-centered. Traditional teaching often emphasizes content knowledge and rote memorization of facts and concepts. Students passively receive information and instruction from the teacher. Information is delivered in a structured, linear manner, typically through lectures, textbooks, and worksheets. The focus is on covering a predefined curriculum. Assessment often consists of quizzes, tests, and exams measuring a student's recall of facts

and information. It may only sometimes reflect a student's ability to apply knowledge. Therefore, some students may become disengaged because of the passive learning approach. Focusing on exams and grades can lead to a superficial understanding of the material. Traditional teaching may only sometimes provide clear connections between classroom learning and real-world applications.

By comparison, MdPjBL is more student-centered. It emphasizes developing 21st-century skills, such as critical thinking, problem-solving, collaboration, communication, and research. Students engage in projects that require them to apply knowledge and skills to real-world challenges. Content is embedded within projects. Students learn as they work on projects, often researching and seeking resources independently to address project-related questions and challenges. Assessment in MdPjBL is more authentic and holistic. Students are evaluated based on their ability to solve real-world problems, collaborate, communicate, and apply what they have learned in the project context. MdPjBL is often more engaging, as it allows students to work on personally meaningful and relevant projects, which can lead to a deeper understanding of the subject matter and increased motivation. MdPjBL focuses on applying knowledge and skills to real-world problems, making the learning more practical and relevant. Therefore, compared with traditional pedagogy, MdPjBL pedagogy significantly affects students' capacities for 5C and technology applications.

The students' project research outcomes of the two schools showed cultural and contextual differences, which likely stemmed from such factors as environment, resources, and lifestyle. Regarding environment and resources, students in aboriginal area live in more remote areas and may need more resources and facilities than what they have available. By contrast, students in urban area might have easier access to modern equipment and resources, such as high-quality photographic equipment and computer software, which can help them create more professional content.

Students in urban areas generally have more educational opportunities and access to resources than students in aboriginal areas and may, therefore, have greater knowledge and skills, which is advantageous for creating public service announcements about plastic issues. Students in aboriginal areas might need greater support and training to fill their knowledge gaps.

Aboriginal- and urban-area students also have different cultural and linguistic backgrounds, leading to different visual styles, storylines, and ways of conveying their creativity and expression in advertising production. Nevertheless, students in both cases A and B advocated for the urgency and importance of solving the problems with plastics through creative design and production.

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Authors contributions

Dr. Su-Ching Lin was responsible for study design, implementation, revision. She also

approved the final manuscript.

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Competing interests

The author declares that she has no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Informed consent

Obtained.

Ethics approval

The Publication Ethics Committee of the Macrothink Institute.

The journal's policies adhere to the Core Practices established by the Committee on Publication Ethics (COPE).

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Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Data sharing statement

No additional data are available.

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