Project-based Learning to Develop the 21st-century Skills for Vocational College Students

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Abstract. Project-Based Learning (PBL) is critical to acquire important 21st-century skills and prepare students for future success. From February to April 2025, we executed a PBL called Digital Coaching Clinic, in which students found communities and assisted them in managing their social media accounts to increase brand awareness. This study aims to investigate the influence of PBL on the development of the 21st-century Skills for Vocational College students. The skills are categorized into three: learning skills (creativity, innovation, critical thinking, problem-solving, decision-making, learning to learn, communication and collaboration), literacy skills (information literacy and ICT literacy), and life skills (citizenship, life and career, cultural awareness and competence). The method employed is to distribute a Google Form questionnaire with 34 items on a Likert Scale ranging from 1 (strongly disagree) to 5 (strongly agree) to active students of Bachelor of Applied English, Vocational College, UGM who participated in the International Cross-cultural Communication Class. Respondents numbered 31. The data were analysed using the One-Sample T-Test to determine the mean difference between the hypothesised mean and the obtained mean. The results showed that all items have p=.000 (<.05), indicating that all means are significantly greater than 3. The means vary from approximately 4.09 to 4.90, indicating that respondents consistently rated the claims positively. Decision-making question during PBL has the lowest mean difference (1.09), indicating that this skill is the least developed. While the biggest mean difference is 1.90 for question concerning collaboration skill, this skill develops the most during PBL implementation.

Keywords: 21st-century skills, One-Sample T-Test, Project-based Learning, Vocational Students.

1 Introduction

1.1 The Importance of PBL for Gen Z Students in Vocational Education

The swift evolution of businesses in the digital age has heightened the necessity for graduates equipped with both specialized knowledge and robust 21st-century competencies, including cooperation, critical thinking, digital literacy, and cultural awareness.

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In vocational higher education, these qualities are essential, as graduates must seamlessly integrate into practice-oriented professional settings. Project-Based Learning (PBL) is acknowledged as an educational methodology that connects academic knowledge with practical application by involving students in genuine, problem-solving activities [4,16].

Prior international research indicates that PBL enhances collaboration, communication, problem-solving, and cultural competence in various educational settings, such as engineering, teacher education, and language acquisition [11, 24]. In vocational education, PBL has demonstrated its efficacy in improving students' employability skills and preparedness for technology-driven workplaces by integrating learning within authentic professional contexts [12]. Nonetheless, empirical information concerning applied language programs in vocational colleges, especially within Southeast Asian contexts, is scarce.

Generation Z comprises the predominant demographic of contemporary vocational college students and signifies the group poised to control the workforce imminently. Contemporary vocational colleges and trade programs are increasingly populated by Generation Z students, indicating a wider generational shift towards "earn-while-you-learn" and skills-oriented post-secondary pathways, all within the framework of higher/vocational education [15, 23]. Despite their proficiency with technology and online platforms, Gen Z students exhibit significant deficiencies in non-technical skills, including decision-making, problem-solving, sustained collaboration, and effective interpersonal communication [2, 8, 21]. These deficiencies are especially significant in vocational education, where graduates are anticipated to excel in practical, client-facing, and community-focused professional environments. Thus, Generation Z emerges as a pertinent target demographic for investigating instructional strategies designed to enhance 21st-century competencies.

This study addresses this gap by investigating the execution of a community-based PBL project—Digital Coaching Clinic—in an International Cross-Cultural Communication course at a vocational college in Indonesia. The initiative necessitated students to engage with actual communities and organizations to create and oversee social media material, thereby amalgamating language proficiency, digital literacy, and intercultural communication. This study examines students' perceived advancement in learning, literacy, and life skills, thereby contributing to the expanding global dialogue on project-based learning (PBL) as an effective pedagogical approach for cultivating 21st-century competencies in vocational education.

1.2 Gen Z's Challenges in Facing Real-World Connections

Generation Z or (Gen Z) is a generation after Millennials/ Generation Y in which the people belong to this generation were born between 1996-2012 [20]. Some characteristics of Gen Z include being impatient, instant-minded, less ambitious, suffering from attention deficit disorder, being highly dependent on the technology, having a low attention span [10]. In addition, [6] stated that Gen Z lacks problem-solving, analytical and decision-making skills. Gen Z, often referred to as digital natives, has shown de-

pendency on gadgets and the Internet, significantly changing their lifestyle, social interactions, and educational methodologies. If their integration of technology into various aspects of their life cannot be controlled, Gen Z might suffer from internet addiction which leads to psychological and social implications.

However, this dependency carries implications for industries reliant on digital interactions, particularly in banking, e-commerce, and other sectors utilizing advanced technologies. The development of mobile banking, for instance, shows how Generation Z's technological fluency presents new opportunities and challenges for businesses aiming to engage this demographic [19]. The emergence of digital natives in the workforce further complicates traditional workplace dynamics, necessitating a re-evaluation of engagement strategies and methodologies [17].

Since Gen Z is too focused on their gadgets and the internet, they are not familiar with real-world connections and how to interact with people in the real world. [14] posit that the psychological impact of social media can create a situation where individuals feel connected virtually but increasingly isolated in real life. This phenomenon is often called social displacement. And this happens to Gen Z. Another problem is communication style and culture; Gen Z employees often miscommunicate and have conflicts with older colleagues over differing communication styles. Although the development of digital technology and AI is now dominating several fields of business, human interaction is still important in the workplace. Some advantages of human interaction are teamwork and collaboration, engagement, innovation, job performance, problem-solving and organizational culture. Therefore, real-world connections are still relevant and important to support the success of Gen Z in their life.

1.3 PBL to Improve the 21st Century Skills

Twenty-first-century skills are abilities and attributes that can be taught or learned to enhance ways of thinking, learning, working and living in the world [3]. The skills include creativity and innovation, critical thinking/problem solving/decision making, learning to learn/metacognition, communication, collaboration (teamwork), information literacy, ICT literacy, citizenship (local and global citizenship), life and career skills, and personal and social responsibility (including cultural awareness and competence). Learning skills include some skills such as creativity, critical thinking, problem-solving, decision-making, learning to learn, communication, and collaboration. Meanwhile, literacy skills consist of some skills like information literacy, ICT/digital tools, content creation. Finally, life skills include citizenship, life and career, cultural awareness/community. Possessing and mastering 21st century skills is crucial for vocational students prior to entering the actual workforce. If the students have these skills, they can address real-world challenges efficiently. We have a question; how can we develop the 21st century skills of vocational students who are mostly gen z? What if we challenge them to the real world to communicate and help society? We think that PBL is the answer.

PBL or Project-based learning is applied as an exercise for students to develop their skills before graduating from college. Project-based learning (PBL) is a student-centred

approach where learners actively engage with real-world problems and collaborate socially to construct knowledge. It emphasizes context-specific learning through authentic questions, leading to meaningful experiences and goal achievement [1, 5, 25]. Various studies have underscored the impact of PBL to academic achievement and 21st century skills, such as collaboration, cultural awareness, critical thinking, and problem-solving [4, 11, 16]. Therefore, PBL is seen appropriate to be implemented in vocational college setting to prepare the students with necessary skills for workplace. We decided to implement PBL in our International Cross-Cultural Communication class through a project called Digital Coaching Clinic. This project aims to assist SME's, non-profit organizations or government institutions in building brand awareness through social media platforms. As argued by [12], project work requires students to collaboratively contribute to the shared outcome through experiential learning with active reflection and conscious engagement, in this case, the students, working in group, had to contact the business owners/ administrators to assist them in creating social media accounts and digital content. The project was implemented in February through April 2025. The students involving in this project were 31 students of Bachelor of Applied English, Vocational College, Universitas Gadjah Mada taking International Cross-cultural Communication class. The students assisted 10 communities. We want to see the influence of this PBL on our students' 21st-century skills. Thus, our research aims to:

1. investigate the influence of PBL on the development of the 21st-century Skills for Vocational College students
2. identify which skills develop the most and the least during the implementation of PBL

2 Method

2.1 The Implementation of Digital Coaching Clinic Project

First, we asked the students to do Digital Coaching Clinic Project under several instructions. This project was a group work while per group consists of 3-4 students. They needed to research about a community or MSME who needs assistance especially in creating and managing social media for promotion and marketing purposes. The location of the project was not only limited to Yogyakarta but also other cities in Indonesia since the students were able to do this project remotely. The students needed to understand the vision, missions, goals, values, human resources, activities and programs of the assisted communities. Then, the students started to promote the existence of the communities by making content about the communities on social media to boost their brand awareness.

The students made at least two social media platforms (e.g.: Instagram and TikTok). If the communities already have social media accounts, the students can manage theirs or make the new ones. The students posted at least 2 pieces of content about the communities both in English and Indonesian every week. If the target market of the communities is Indonesians, the content is made in Indonesian completed with English subtitle. The period of posting was March-April 2025. After the project finished, the students needed to make a presentation and write a report. The presentation slides must

contain details of the community information (name, address, contact, field, vision and missions), overview of the community, social media accounts that are created, Information about posts/ content that have been created, summary of engagement (number of views, likes, comments, share), challenges the students faced during the process, testimonials of community managers about Digital Coaching Clinic project. The students presented the outcome of the project during the midterm exam period, and they needed to submit presentation slides and the report through the university's LMS called e-LOK.

2.2 Data Collection Technique

This study is quantitative research with a survey method to investigate the influence of PBL on the 21st century skill development of Vocational College students. The design was selected because quantitative approaches allow for a systematic hypothesis testing and objective evaluation of intervention effects [7]. The main focus was to measure whether the students' perception of their 21st Century Skills significantly exceeded the neutral baseline (Likert Scale mid-point = 3) after engaging in the Digital Coaching Clinic.

The participants were 31 active students of Bachelor of Applied English, Vocational College, Universitas Gadjah Mada enrolled in the International Cross-cultural Communication class held in Spring Semester, Academic Year 2024/2025 from February-June 2025. The sampling technique was purposive sampling, as students were selected based on their direct involvement in the PBL project, ensuring that they had first-hand experience with the evaluated program. The sample consists of 14 male students (45.2%) and 17 female students (54.8%). While based on age distribution, there are 7 students (22.6%) are 18 years old, 16 students are 19 years old (51.6%), 7 students are 20 years old (22.6%) and 1 student is 21 years old (3.2%) confirming that all of them are Generation Z that reflects the typical college/university students who are digital natives and positioned to benefit from 21st century skill development. The research aims to find out the influence of PBL implementation (X) on the development of 21st century skills of the students (Y).

The instrument used was a structured questionnaire distributed through Google form survey, containing 33 statement items measured using a five-point Likert scale: 1 (strongly disagree), 2 (disagree), 3 (neutral), 4 (agree), and 5 (strongly agree). The questions were designed to capture three broad categories of 21st century skills defined by Binkley et al. (2010), which include 21 items to examine learning skills (Y1), 6 items to investigate literacy skills (Y2) and 6 items to identify life skills (Y3). The learning skills-related items include the statements about creativity, critical thinking, problem-solving, decision-making, learning to learn, communication, collaboration. The literacy skills-related items explore information literacy, ICT/digital tools, and content creation. Meanwhile, regarding life skills, the items state aspects of citizenship, life and career, cultural awareness/community.

2.3 Data Analysis

To ensure the validity and reliability of the instrument, we did validity and reliability tests. There are two criteria to determine validity of test items which are as follows:

a. If rvalue > rtable at the level significance of 5%, it means the instrument is valid
b. If rvalue < rtable at the level significance of 5%, it means the instrument is invalid

The validity test uses Pearson correlation formula from Statistical Package for Social Science (SPSS) version 21. We determined the significance level of the test was 5% from confident interval 95% and the rtable of the test was 0.355 for 31 respondents. The results show that the learning skills (Y1) category has Pearson correlation (rvalue) from 0.440-0.856, the literacy skills (Y2) category has rvalue from 0.496-0.818 and the life skills category (Y3) has rvalue 0.627-0.843. Since all items in the questionnaire have greater correlation than 0.355, it means all the items are valid.

Reliability was tested using Cronbach's Alpha to measure internal consistency of the questionnaire. We referred to the following table to determine the reliability level.

Table 1. The table of Reliability Level Classification

No	Coefficient of Cronbach's Alpha	Reliability Level
1.	More than 0.90	Excellent
2.	0.80-0.89	Good
3.	0.70-0.79	Acceptable
4.	0.6-0.69	Questionable
5.	0.5-0.59	Poor
6.	Less than 0.59	Unacceptable

The result of reliability test is shown as follows:

Table 2. Reliability Statistics of the Questionnaire

Cronbach's Alpha	N of Items
.960	33

Since the Cronbach's Alpha for 33 items shows 0.960, it means that the reliability level of the questionnaire is excellent and shows high level of internal consistency.

The primary statistical analysis used was the One Sample t-test for evaluating the influence of PBL on the development of students' 21st century skills. This method was selected because it allows us to evaluate whether the mean score of students' 21st century skills after PBL implementation is significantly different from hypothesised value, in this case 3 as the neutral point of our Likert scale in the questionnaire. The hypotheses for this study were formulated as follows:

H_0: There is no significant difference between the students' mean score on 21st century skills and the neutral test value of 3, meaning that PBL does not significantly promote 21st century skills.

H_1: There is a significant difference between the students' mean score on 21st century skills and the test value of 3, indicating that PBL promotes their 21st century skills.

A One-Sample t-test was utilized to assess if students' reported levels of 21st-century skills post-participation in the PBL project were substantially elevated compared to a neutral baseline (Likert scale midpoint = 3). This statistical method is suitable for comparing a sample mean with a known or hypothesized value [7]. Considering the study's emphasis on assessing if PBL resulted in a significant positive divergence from neutrality instead than comparing other groups, the One-Sample t-test was deemed the most appropriate analytical method.

Although the sample size was modest (N = 31), this limitation is mitigated using validated instruments with excellent internal consistency (Cronbach's $\alpha = .960$), so augmenting the reliability of the findings. However, the findings are seen as context-dependent and exploratory rather than universally applicable.

Significance was assessed at $\alpha = 0.05$. For each item, SPSS generated t-values, degrees of freedom (df = N-1 = 30), and p-values. Rejection of H0 occurred when $p < 0.05$, and thus the alternative hypothesis claiming that PBL significantly enhanced the skills is accepted.

3 Results and Discussion

3.1 The Results of One-Sample T-Test

The one-sample t-test was conducted to determine whether the students' self-reported perceptions of their 21st century skills after PBL differed significantly from the neutral value of 3 on the Likert scale. Across all 33 items, the results were statistically significant at $p < 0.001$, indicating that the observed means were consistently higher than the hypothesised mean. This provides strong evidence that the implementation of PBL through the Digital Coaching Clinic had a positive influence on the development of students' 21st century skills. The following table conveys the first output of One Sample t-test.

Table 3. One-Sample Statistics

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
Y1.1	31	4.48	.570	.102
Y1.2	31	4.45	.850	.153
Y1.3	31	4.45	.768	.138
Y1.4	31	4.42	.886	.159
Y1.5	31	4.32	.909	.163
Y1.6	31	4.52	.851	.153
Y1.7	31	4.29	.864	.155
Y1.8	31	4.42	.720	.129
Y1.9	31	4.58	.620	.111
Y1.10	31	4.16	.969	.174
Y1.11	31	4.42	.765	.137
Y1.12	31	4.10	1.248	.224
Y1.13	31	4.52	.811	.146
Y1.14	31	4.29	.938	.168
Y1.15	31	4.55	.624	.112
Y1.16	31	4.39	.882	.158
Y1.17	31	4.26	1.032	.185
Y1.18	31	4.42	.848	.152
Y1.19	31	4.45	.768	.138
Y1.20	31	4.65	.608	.109
Y1.21	31	4.77	.497	.089
Y2.1	31	4.5484	.62390	.11206
Y2.2	31	4.3871	.88232	.15847
Y2.3	31	4.5806	.71992	.12930
Y2.4	31	4.6129	.71542	.12849
Y2.5	31	4.5484	.67521	.12127
Y2.6	31	4.2903	.82436	.14806
Y3.1	31	4.6129	.61522	.11050
Y3.2	31	4.6774	.47519	.08535
Y3.3	31	4.3871	.71542	.12849
Y3.4	31	4.6129	.55842	.10029
Y3.5	31	4.3548	.91464	.16427
Y3.6	31	4.7097	.46141	.08287

From the table we can see that there are 33 items of questions distributed to 31 respondents (N), the mean scores across items are ranging from the lowest 4.10 to the highest 4.77, representing a clear positive shift compared to the neutral baseline of 3. The standard of deviation also ranges from 0.46141 to 1.248 and the standard error mean ranges from 0.08287 to 0.15847.

The mean differences were consistently above 1.0, with the smallest mean difference observed in decision making skills (1.09) and the largest in collaboration skills (1.77) as depicted in Table 4, the second output is about the value of the statistical test:

Table 4. T One-Sample Test

One-Sample Test

	Test Value = 3					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Y1.1	14.498	30	.000	1.484	1.27	1.69
Y1.2	9.508	30	.000	1.452	1.14	1.76
Y1.3	10.529	30	.000	1.452	1.17	1.73
Y1.4	8.920	30	.000	1.419	1.09	1.74
Y1.5	8.103	30	.000	1.323	.99	1.66
Y1.6	9.916	30	.000	1.516	1.20	1.83
Y1.7	8.317	30	.000	1.290	.97	1.61
Y1.8	10.977	30	.000	1.419	1.16	1.68
Y1.9	14.185	30	.000	1.581	1.35	1.81
Y1.10	6.670	30	.000	1.161	.81	1.52
Y1.11	10.333	30	.000	1.419	1.14	1.70
Y1.12	4.894	30	.000	1.097	.64	1.55
Y1.13	10.406	30	.000	1.516	1.22	1.81
Y1.14	7.660	30	.000	1.290	.95	1.63
Y1.15	13.818	30	.000	1.548	1.32	1.78
Y1.16	8.753	30	.000	1.387	1.06	1.71
Y1.17	6.789	30	.000	1.258	.88	1.64
Y1.18	9.324	30	.000	1.419	1.11	1.73
Y1.19	10.529	30	.000	1.452	1.17	1.73
Y1.20	15.061	30	.000	1.645	1.42	1.87
Y1.21	19.864	30	.000	1.774	1.59	1.96
Y2.1	13.818	30	.000	1.54839	1.3195	1.7772
Y2.2	8.753	30	.000	1.38710	1.0635	1.7107
Y2.3	12.225	30	.000	1.58065	1.3166	1.8447
Y2.4	12.552	30	.000	1.61290	1.3505	1.8753
Y2.5	12.768	30	.000	1.54839	1.3007	1.7961
Y2.6	8.715	30	.000	1.29032	.9879	1.5927
Y3.1	14.597	30	.000	1.61290	1.3872	1.8386
Y3.2	19.654	30	.000	1.67742	1.5031	1.8517
Y3.3	10.795	30	.000	1.38710	1.1247	1.6495
Y3.4	16.082	30	.000	1.61290	1.4081	1.8177
Y3.5	8.247	30	.000	1.35484	1.0193	1.6903
Y3.6	20.630	30	.000	1.70968	1.5404	1.8789

The first column indicates the item in the questionnaire. Y1 indicates the statements related to learning skills. There are 21 items which convey the skills included in the learning skills. Items Y1.1 to Y1.3 identify creativity and Innovation skills implemented during the PBL such as experimenting with different approaches to present the community brands, generating new ideas for social media content and developing outside the box digital content. Items Y1.4 to Y1.6 describe critical thinking skills depicted in statements such as analysing the community's needs and target audience, evaluating different social media strategies and applying different perspectives when planning social media campaigns. Meanwhile, items Y1.7 to Y1.10 explore problem-solving skills under statements such as challenges while creating social media accounts and content, technical difficulties related to social media platforms, non-technical issues emerging

during the PBL and adaptation to implement social media strategies. Y1.11 to Y1.13 indicate the development of decision-making skills under statements such as informing decision about type of content for community, taking responsibility for the choices made regarding social media presence and prioritising tasks to meet the project deadlines. Y1.14 to Y1.16 explore students' learning to learn skills stated in items such as actively seeking new information and skills related to social media, learning from the mistakes, and taking initiative to improve digital content creation. Y1.17 to Y1.19 indicate students' communication skills depicted in statements such as communicating well with the community representative/ business owners, clearly presenting ideas and plans for social media to the community and conveying information effectively through social media content. Finally, items Y1.20 and Y1.21 indicate the development of students' collaboration skills under two statements such as working effectively with group members to plan and execute the social media strategies and sharing responsibilities and contributing equally to the project.

Items labelled as Y2 indicate literacy skills of the students. Y2.1 to Y2.3 contain statements such as being able to find and evaluate relevant information about the community, using online resources effectively and learning about social media best practices and understanding the importance of using credible sources for information. Y2.4 to Y2.6 indicate ICT literacy skill depicted in statements such as using various social media platforms to create and manage content, utilising different digital tools and software for content creation and editing and demonstrating proficiency in using technology for communication and collaboration. The last skill, life skills are represented by items Y3 in which Y3.1 and Y3.2 demonstrate citizenship skill under statements such as developing responsibility towards the community assisted and learning the importance of digital presence for organisations. Life and career skills are represented by Y3.3's statement that the project has increased students' interest in pursuing careers related to digital marketing or community engagement. Last but not least, Y3.4 to Y3.6 contain statements that the students can show sensitivity and respect towards the community's values and culture, consider the cultural context in the community when planning communication strategies and gain better understanding of the role of social media in promoting diverse communities.

The second column shows the t- values displaying standard errors the sample mean is away from the hypothesised test value which is 3. A larger t-value means a greater difference from the test value. Column three depicts degree of freedom (df) defining the critical value of t from the t-distribution. Since we have 31 respondents, the df is 30. Our research is a two-tailed test because we examine whether the mean is significantly different from the hypothesised value in either direction not just a specific direction, and our results evaluate if the observed mean differs from a neutral or hypothesised value rather than testing an effect only above or below that mean.

The fourth column is mean difference indicating how much higher or lower the sample mean is compared to the test value. In our research the mean difference values are between 1.2 and 1.7 so we make classification system to define the strength of mean difference, as follows: small difference (0.20-0.49), moderate difference (0.50-0.99) and large difference ≥ 1. Since all mean differences in all items are higher than 1, we can see that all items are large differences compared to the test value = 3.

3.2 Data Interpretation

The result of overall average Mean Difference of three skill categories after PBL revealed important patterns that can be seen in Figure 1. The specific score for average Mean Difference for learning skills is 1.424, followed by 1.495 for literacy skills and 1.559 for life skills. These findings suggest that while all domains improved substantially, life skills developed the most, followed by literacy and learning skills.

The enhanced development of life skills relative to learning skills indicates that the community-based framework of the Digital Coaching Clinic offered learning opportunities that transcended cognitive or academic abilities. Critical thinking and decision-making skills are typically developed through structured classroom tasks, whereas life skills, especially cultural awareness and citizenship, are more effectively cultivated through direct engagement with authentic social contexts. Generation Z students, often noted for their digital fluency yet limited experience in face-to-face interactions, may benefit from community immersion as a corrective learning environment that integrates digital skills with social responsibility.

This pattern is particularly noteworthy because life skills that includes citizenship, cultural competence, and career awareness are often perceived as more challenging to develop through formal classroom learning. The fact that PBL contributed strongly to the dimensions of life skills underscores its effectiveness in connecting the academic learning with real-world practice. Specifically, life skill measurement was represented by items Y3.1 to Y3.6. The mean scores for these items range from 4.35-4.71 with mean differences are from 1.35 to 1.71. The highest mean (4.71) occurs in item Y3.6, which shows cultural awareness and competence skill. The item states, “I gained a better understanding of the role of social media in promoting diverse communities.” It shows that the respondents understand the role of social media in promoting diverse communities. This PBL can gather 10 communities, organisations or MSMEs with different cores of business such as FnB, education, sports, room rental business, handicraft, government institution and community-based facilities. Thus, the respondents could see how different communities or organisations also influences on different characteristics of content and social media strategies since not all of them are profit oriented. In addition, the highest T-values (up to 20.63) depict responses were highly consistent and strongly positive. The results show that the Digital Coaching Clinic required students not only to create and manage social media accounts, but also engage with community representatives, respect cultural values, and understand organisational missions. This immersion in authentic contexts appears to have fostered high cultural awareness and a sense of social responsibility. This is consistent with [3], who argue that cultural competence and citizenship are core dimensions of 21st century skills that emerge more strongly when learners are exposed to authentic, real-world challenges. Similarly, [16] emphasised that PBL tasks grounded in real-world problems significantly improve academic, personal and social skills.

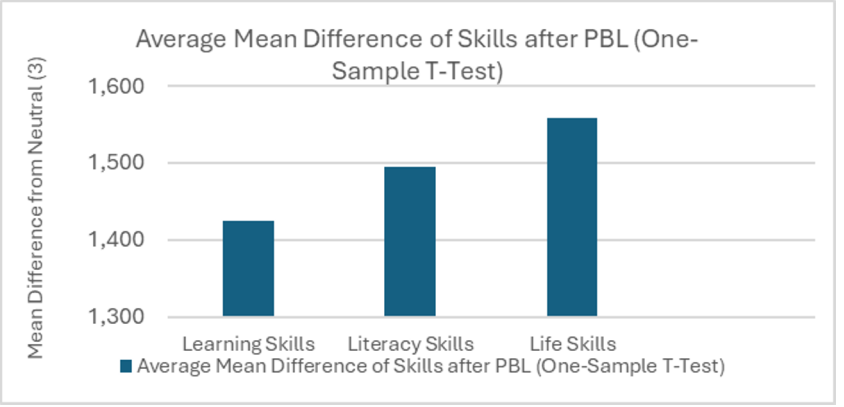

Fig. 1. Average Mean Difference of Skills After PBL (One-Sample T-Test)

The second highest category is literacy skills that were represented by items from Y2.1 to Y2.6. All mean scores vary from 4.29 -4.61 with mean differences ranging from 1.29 to 1.61. The item which has the highest mean is Y2.4 with 4.61. This score conveys that the respondents give strong agreement to the item's statement which relates to the ICT literacy. The item says, "I confidently used various social media platforms to create and manage content." Consistent responses across all items indicate that students gained confidence in using technology and evaluating information. This result is not surprising since the core of Digital Coaching Clinic is to create 2 social media accounts from different platforms. The respondents also presented all social media accounts completed with digital content they created, and engagement rate as evidence. Thus, their ICT literacy develops significantly during and after the PBL implementation. This illustrates how PBL equips students with practical, transferrable ICT skills crucial for vocational students who should be ready for technology-mediated workplaces.

The least developed category was learning skills represented by items Y1.1 to Y1.21, with the mean scores range from 4.1-4.77, significantly above 3. It is also noticeable that the mean differences are between 1.9 to 1.77 which display large positive shift from neutral. From all items, the highest mean (4.77) occurs in item Y1.21 about collaboration skills stating, "I shared responsibilities and contributed equally to the project". This means that respondents strongly agree that this item represents their learning experience during the implementation of PBL. The respondents feel that their collaboration skill, especially in contributing to the project equally, is significantly developing during the implementation of PBL. In the current study, the Digital Coaching Clinic provided repeated opportunities for collaboration, such as co-creating content, negotiating strategies within team and with the community, as well as sharing workloads among group members, which are argued by [24] as factors essential to create a successful learning community. This explains why collaboration skills emerged as the strongest developed skills. By contrast, the least developed skill in learning skills category represents by item Y1.12, "I took responsibility for the choices made regarding the community's social media presence", representing decision-making skills with the

mean score of 4.10. The mean score shows that the respondents feel that this skill develops the least. Based on the students' presentation, it happened because they think that every decision made during the PBL was collective decision in which not only an individual's job. The very high t-values (up to 19.864) indicate very consistent agreement among respondents. These results reflect that rather than making individual decisions, PBL highly promotes collaboration and collective decisions as a group, which then limited opportunities for personal accountability. This echoes with the findings of a study conducted by [1], who observed that group-based projects tend to prioritise collective problem-solving and collaboration over individual decision-making.

4 Conclusion

The results demonstrate that Project-Based Learning, executed through the Digital Coaching Clinic, markedly improved students perceived 21st-century skills in the domains of learning, literacy, and life skills. Among these, life skills, especially cultural awareness and citizenship, exhibited the most significant advancement, underscoring the need of genuine community involvement in vocational education. Collaboration appeared as the most advanced individual skill, but decision-making was relatively less significant, indicating the collaborative essence of group-oriented undertakings.

These findings have significant implications for the broader implementation of PBL in vocational settings. Vocational institutions are urged to incorporate community-oriented and industry-relevant initiatives into their curricula to develop transferable skills that meet employment requirements. Secondly, PBL design must equilibrate collaborative efforts with defined individual duties, such as rotating leadership positions or reflective decision logs, to enhance individual decision-making capabilities. This study, while dependent on self-reported data, could be enhanced in future research by integrating qualitative methods, such as observations, reflective journals, or interviews with students and community partners, to elucidate deeper learning processes and long-term skill development.

This study substantiates PBL as a pedagogically sound and contextually pertinent method for equipping vocational college students to confront the challenges of 21st-century professional landscapes, while also indicating opportunities for enhancement and additional inquiry.

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