The Development of a Place-Based Educational Program to Enhance Employability Skills through Hydroponic Vegetable Cultivation for Grade 4–6 Students at Ban Huay Pao Nuea School

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Abstract

The objective of this research was to develop a place-based educational program integrating hydroponic vegetable cultivation to enhance employability skills of Grade 4–6 students at Ban Huay Pao Nuea School. The study employed a Research and Development (R&D) design consisting of three phases: (1) problem and needs analysis, (2) program design and development, and (3) implementation and evaluation.The sample group comprised 25 students in Grades 4–6, selected through purposive sampling. Research instruments included lesson plans, a knowledge test, an employability skills assessment, a behavioral observation form, and a student satisfaction questionnaire. Data were analyzed using basic statistics: mean, standard deviation, and t-test.The results revealed that the developed place-based educational program integrating hydroponic vegetable cultivation was highly appropriate, with an average suitability score of 83.33%. After participating in the program, students demonstrated higher levels of knowledge and employability skills, with an average of 76.71%. In addition, student satisfaction toward the learning experience was at the highest level, with an average score of 4.54 In conclusion, the development of a place-based educational program integrating hydroponic vegetable cultivation effectively enhanced the employability skills of elementary school students. This program can serve as a model for educational practices aimed at promoting career skills and lifelong learning for future self-reliance.

Key Words : Employability, Program, Spatial Education, Hydroponic Vegetable Cultivation, Elementary Education

Introduction

Significance of Employability Skills Employability skills are essential competencies that enable learners to apply their knowledge, skills, and personal attributes in real-world work situations and in everyday life within modern society. These competencies include fundamental skills such as teamwork, problem-solving, technological literacy, communication, and social responsibility—qualities that are increasingly

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emphasized by both the labor market and the wider community. Strengthening these competencies from the primary education level helps build a solid foundation that equips students with both academic knowledge and life skills, preparing them for further education and future careers with quality and confidence.

Existing Problems Related to Employability Skills Although educational institutions currently provide learning experiences aimed at developing learners in multiple dimensions, several critical issues remain evident:1)A number of students still lack analytical thinking and problem-solving skills in real situations, 2)Teamwork and leadership skills are insufficiently developed, as learning activities continue to emphasize rote learning rather than practical experience,3) Technological skills and information management abilities are not yet aligned with the rapidly changing digital society and 4) Some students lack awareness of moral values, ethics, responsibility, and self-discipline in work-related tasks.

Therefore, implementing place-based education that integrates activities connected to real-life contexts is a key strategy for addressing these challenges.

Conceptual Approaches and Evidence-Based Practices Previous research has demonstrated that place-based education and experiential learning are effective approaches for enhancing employability skills. Integrating career-related activities—such as agriculture, hydroponic vegetable cultivation, or small business operations—enables students to engage in critical thinking, planning, hands-on practice, collaboration, and reflective learning. These processes contribute to the holistic development of work competencies and desirable personal attributes.

Rationale for Conducting This Research Based on the aforementioned importance and existing problems, developing a place-based educational program using hydroponic vegetable cultivation as a learning tool is considered appropriate and highly compatible with the context of Ban Huai Pao Nuea School. This activity is connected to students' real lives, utilizes local resources, and can generate direct vocational value. Therefore, this research is undertaken with the following purposes:1) To develop a prototype educational program that emphasizes employability competencies,2)To enhance students' skills, knowledge, and desirable personal attributes that prepare them for real-life situations,3)To provide a model that other educational institutions can adapt for developing students' vocational and employability skills in the future.

Research Objectives

1. To design a place-based education program aimed at enhancing the employability skills of Grade 4–6 students at Ban Huai Pao Nuea School.
2. To examine the outcomes of implementing the place-based education program in enhancing the employability skills of Grade 4–6 students at Ban Huai Pao Nuea School.

Theoretical Concepts and Research Framework

This research is grounded in multiple theoretical approaches and educational models, including project-based learning (Bytyqi, 2021), experiential learning (Kong, 2021), internships (Indeed Editorial Team, 2023), career and technical education (Hummel, 2023), entrepreneurship education (Wardana et al., 2020), mentoring programs (Dennison, 2023), digital skills training (Jackman, 2021), community service learning (Sandaran, 2012), competency-based education (Oroszi, 2020), and industry partnership development (Awasthy et al., 2020). These concepts collectively inform the development of a place-based education program designed to enhance the employability skills of Grade 4–6 students at Ban Huai Pao Nuea School. A synthesis of international and Thai literature on employability skills indicates that employability comprises three major components: **soft skills**, **technical skills**, and **personal attributes**. Further analysis of frequently cited components of employability skills in international literature reveals six dominant elements:1) Leadership and teamwork,2) Problem-solving and adaptability,3) Technological skills,4)Tourism interest,5)Empathy and social awareness,6)Health and well-being interest and 7)Language proficiency(Carpenter et al., 2024; Prabowo et al., 2023; Long & Nga, 2022; Guàrdia et al., 2021; Williams et al., 2015; Husain et al., 2014) These elements constitute the conceptual framework for this study, as illustrated in Figure 1.

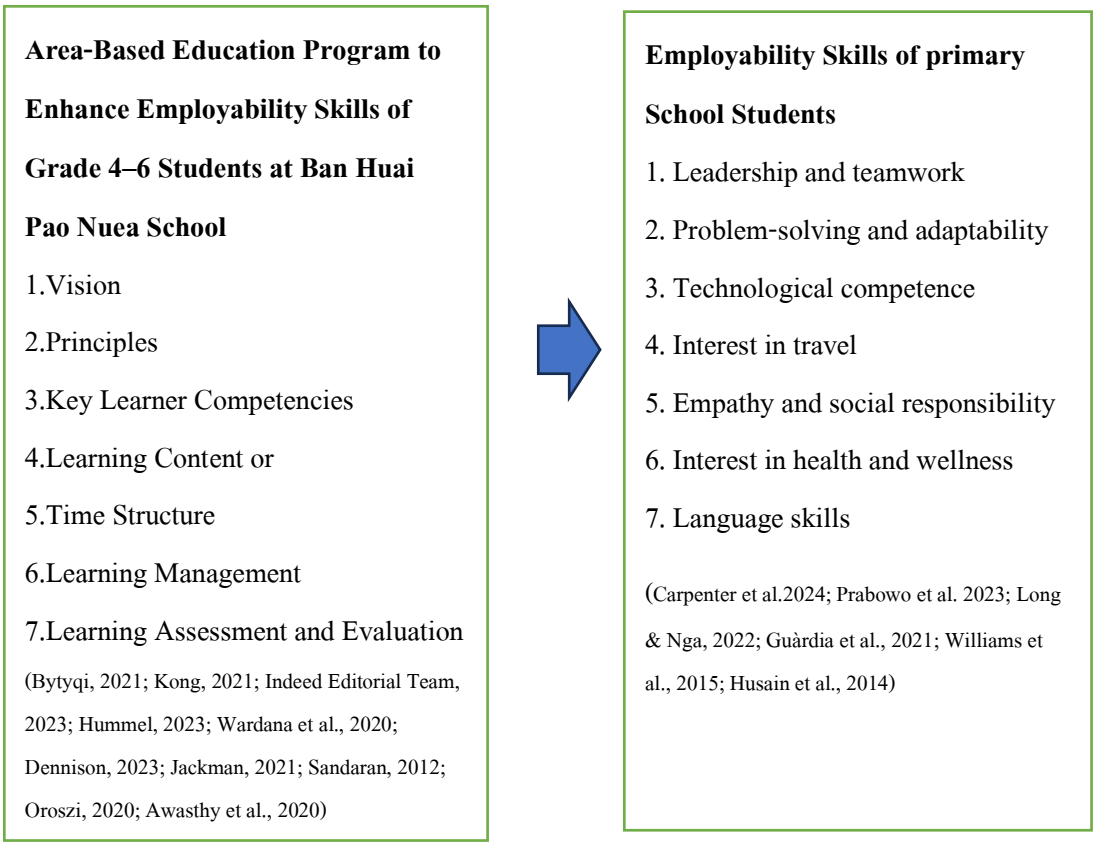

Figure 1 Research conceptual Framework

Research Methodology

This study was conducted from November 2024 to August 2025 and implemented during the first semester of Academic Year 2025. A quasi-experimental research design—One Group Posttest-Only Design—was employed.

1. Participants Three groups of participants were selected using purposive sampling:

1.1 Stakeholders (16 participants): supervisors, school administrators, teachers, and community representatives who participated in program development workshops.

1.2 Experts (3 participants): educational scholars, specialists in educational management, and policy-level administrators who reviewed the program.

1.3 Students (25 participants): Grade 4–6 students at Ban Huaipao Nuea School.

2. Research Instruments

2.1 Program Design Record Form: open-ended format used during stakeholder workshops.

2.2 Program Validation Checklist: used by experts to assess the draft program.

2.3 Employability Skills Assessment Rubric: four performance levels—Excellent (4), Good (3), Fair (2), Needs Improvement (1).

2.4 Student Satisfaction Questionnaire: a five-point rating scale consisting of 20 items (Boonchom Srisawat, 2017).

3. Development and Quality Verification of Research Instruments

3.1 Record Form for School Educational Program Design. This instrument was developed by reviewing literature and research related to Design Thinking to define the instrument's components. It was structured as a set of open-ended questions. Content validity was verified by five experts (Supervisor Ritwat, Supervisor Wanida, Supervisor Juthaporn, Mr. Chao, Mr. Supachai, and Director Kampanat). The analysis of the Index of Item-Objective Congruence (IOC) revealed that all items had an IOC value of 1.00, indicating valid content. The instrument was pilot-tested during an internal preparatory meeting with teachers before being implemented in the actual workshop with stakeholders to draft the program.

3.2 Checklist for School Educational Program Draft. Developed by studying research related to program evaluation to determine the components, this tool was designed as a checklist. Content validity was verified by five experts, with an IOC analysis showing a value of 1.00 for all items. To test for reliability, two teachers independently evaluated the school's draft program. The analysis of inter-rater agreement yielded a percentage of 83.33%, which exceeds the 70% threshold, demonstrating that the instrument possesses acceptable inter-rater reliability.

3.3 Assessment Form for Student Employability Skills. The researcher reviewed literature concerning the measurement and evaluation of employability skills to determine assessment criteria based on skill components. The instrument was constructed as a scoring rubric with four quality levels. Content validity was examined by five experts, resulting in an IOC value of 1.00 for all items. For reliability testing, two teachers assessed the same student. The Intraclass Correlation Coefficient (ICC) was calculated to be 0.926, indicating a high level of inter-rater reliability suitable for implementation.

3.4 Satisfaction Questionnaire. The researcher studied literature related to satisfaction measurement and evaluation to define assessment criteria. The questionnaire was constructed using a 5-point rating scale comprising 20 items. Content validity was verified by five experts, with an IOC value of 1.00 for all items. The instrument was pilot-tested (try-out) with 30 students from another school within the research project. Reliability was analyzed using Cronbach's Alpha Coefficient, resulting in a value of 0.989.

4. Data Collection The researcher conducted the data collection process as follows:

4.1 Project Orientation: Attended a meeting with the Loei Provincial Education Office to gain a clear understanding of the research project objectives on November 14, 2024, at the meeting room of the Loei Provincial Education Office.

4.2 Project Approval: School administrators presented the area-based research project to clarify objectives and request approval for project implementation.

4.3 Preparation Meeting: Participated in a meeting with the Loei Provincial Education Office to prepare for the development of the area-based education program aimed at enhancing employability skills for Grade 4 students at Ban Huai Pao Nuea School. The meeting was held on March 13, 2025, at the Loei Provincial Education Office.

4.4 Context Analysis: Administrators, teachers, and students collaboratively analyzed the school context data to prepare information prior to the workshop (corresponding to the Empathize and Define stages).

4.5 Stakeholder Workshop: Conducted a workshop with stakeholders to draft the area-based education program for enhancing employability skills of Grade 4-6 students at Ban Huai Pao Nuea School. There were 16 participants, consisting of 6 teachers and educational personnel, 3 community leaders, 2 parent representatives, 3 researchers from the Loei Provincial Education Office, and 2 hydroponics experts.The school utilized the 5 steps of the Design Thinking process to draft the educational program as follows:1) Empathize: Analyzing the current state of employability skills among Grade 4-6 students at Ban Huai Pao Nuea School.2) Define: Stakeholders brainstormed to define problems and formulate

questions leading to the creation of guidelines and methods for the area-based education program.3) Ideate: Drafting the area-based education program using hydroponics farming as the core activity, comprising the following sub-activities: 1.Building inspiration and motivation for hydroponics farming.2.Visiting example hydroponic farms (video or field trip). 3.Designing hydroponic plots (groups of 5 students).4.Constructing the actual planting system. 5.Practical planting: preparing water, nutrient solutions, and seedlings.6.Vegetable care: checking pH levels. 7.Practicing introducing the vegetables to foreigners in English. 8.Analyzing problems occurring during cultivation and proposing solutions.9.Organizing a "Farm Tour" activity, inviting friends to visit, with students acting as presenters.10.Lesson conclusion: writing planting reports / group presentations.11.Evaluation / Knowledge sharing.4) Prototype: Developing the details and components of the program, followed by expert verification. The researcher presented the draft program at a meeting. Prior to the testing stage, a critique meeting was held to verify the draft program with the Loei Provincial Education Office and 13 other schools on May 20, 2025 (08:30-16:30) at Forra Hill Resort, Loei. It was found that the evaluation criteria and measurement tools were unclear. Consequently, the rubric scores for the 7 employability skills were adjusted to include Self-Assessment and Peer-Assessment tools.5) Test: Implementing the prototype of the area-based education program with the target group of Grade 4-6 students at Ban Huai Pao Nuea School.

4.6 Supervision: Received supervision on the implementation of the program during Phase 2 and Phase 3.

4.7 Evaluation: Assessed the students' employability skills and their satisfaction with the educational program.

4.8 Dissemination: Presentation and dissemination of results.

5. Data Analysis

5.1 Basic Student Data Data derived from the employability skills assessment and satisfaction survey regarding student backgrounds were analyzed using basic statistics: Frequency and Percentage.

5.2 Employability Skills Assessment Scores from the assessment of students' employability were analyzed using basic statistics, including percentages, and then compared to the good quality criteria using a one-sample t-test. The interpretation criteria for the scores were as follows: 80-100% indicates students' employability is Excellent; 70-79% indicates students' employability is Good; 60-69% indicates students' employability is Fair; Less than 60% indicates students' employability is Improvement.

5.3 Student satisfaction scores were analyzed using basic statistics, including means and standard deviations. The interpretation criteria for the mean values were as follows (Bunchom Srisa-ard, 2017):

4.51-5.00 indicates extremely satisfied; 3.51-4.50 indicates highly satisfied; 2.51-3.50 indicates moderately satisfied; 1.51-2.50 means slightly satisfied and 1.00 -1.50 means least satisfied.

Results

The research findings are presented according to the research objectives.

1. Results of the Program Design

1.1 Results of the Program Implementation

The **Area-Based Educational Program**, which integrated **hydroponics farming**, was found to be at a **Very Good** level of suitability.**Student Outcomes:** After participating in the activities, students achieved scores in **knowledge and essential employability competencies** that were **higher than the established criteria**.**Satisfaction:** Students expressed **satisfaction** with the learning process at the **Highest** level.**Conclusion:** The development of the area-based educational program integrating hydroponics farming effectively promotes essential employability competencies among primary school students. This program can serve as a valuable guideline for future educational management aimed at developing career and life skills.

1.2 Results of Program Verification The verification of the school's draft educational program was conducted as follows:**Instrument:** A **checklist** was developed based on program evaluation research. **Validation Method:** Content validity was verified by **five experts** using the Index of Item-Objective Congruence (IOC) analysis.**Finding (Based on previous data, implied here):** All items were found to be congruent, typically yielding an IOCof **1.00**

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Assessment Criteria	Expert 1	Expert 2	Expert 3	Summary/ Suggestion
1. Vision				
1.1Reflects the goals of implementing place-based education to promote employability skills within the specific context of Loei Province.	✓	✓	✓	**Congruent**
1.2Aligns with the National Strategy, the National Economic and Social Development Plan, the National Education Plan, and the needs of the labor market.	-	-	-	**Not Congruent**
1.3Focuses on developing learners with essential competencies required for the future.	✓	✓	✓	**Congruent**

Assessment Criteria	Expert 1	Expert 2	Expert 3	Summary/ Suggestion
3. Objectives				
3.1Clearly specify the intended learning outcomes.	✓	✓	✓	**Congruent**
3.2Emphasize measurable outcomes in terms of knowledge, skills, and attitudes.	✓	✓	✓	**Congruent**
3.3Reflect learners' readiness for the future world of work.	✓	✓	✓	**Congruent**
4. Core Student Competencies				
4.1Aligned with 21st-century skills.	✓	✓	✓	**Congruent**
4.2Emphasize life and career skills, such as self-management, digital literacy, and entrepreneurial skills.	✓	✓	✓	**Congruent**
4.3Connected to the core competencies specified in the national curriculum as well as area-specific competencies, particularly those related to health tourism.	✓	✓	✓	**Congruent**
5. Learning Content or Learning Activities				
5.1 The content is designed to integrate general knowledge with vocational expertise and local community contexts.	✓	✓	✓	**Congruent**
5.2 It is comprehensive and appropriate for developing students' employability skills across all seven essential domains.	✓	✓	✓	**Congruent**
5.3 It is flexible and allows schools to adapt and customize the content according to their local context.	✓	✓	✓	**Congruent**
6. Learning Time Structure				
6.1 Clearly allocates time for vocational skill development and experiential learning.	✓	✓	✓	**Congruent**
6.2 Ensures a balance between classroom-based learning and out-of-class learning, such as community-based internships.	✓	✓	✓	**Congruent**
6.3 Facilitates the organization of learning activities and allows for practical, hands-on implementation.	✓	✓	✓	**Congruent**
7. Learning Management				
7.1 Utilizes diverse learning approaches such as project-based learning, fieldwork, and workplace-based learning.	✓	✓	✓	**Congruent**
7.2 Encourages active learner participation through questioning, inquiry, experimentation, and presentation.	✓	✓	✓	**Congruent**
7.3 Promotes the development of all seven essential employability skills in learners.	✓	✓	✓	**Congruent**

Assessment Criteria	Expert 1	Expert 2	Expert 3	Summary/ Suggestion
8. Assessment and Evaluation of Learning Outcomes				
8.1 Employs a variety of assessment tools and methods, including performance-based assessments, instructor and peer evaluations, and other authentic evidence of learning.	-	-	-	**Not Congruent**
8.2 Measures learners' knowledge, skills, and attributes comprehensively using clear and well-defined criteria.	-	-	-	Not **Congruent**
8.3 Emphasizes continuous formative assessment to support and enhance learners' development, rather than solely focusing on summative judgments.	-	-	-	Not **Congruent**

Table 1, The school program draft was verified by experts using a checklist. The overall inter-rater agreement on the suitability of the program was **83.33%**

2. Results of Program Implementation

2.1 Student Demographic Data The sample group consisted of 25 students

Item	Number (N)	Percentage (%)
Gender: Male	16	64
Gender: Female	9	36
Grade 4	3	12
Grade 5	13	52
Grade 6	9	36

Table 2, the basic information of students participating in the project shows that 16 students were male, accounting for 64 percent, and 9 students were female, accounting for 36 percent.

2.2 Employability Skills Scores The overall average score for knowledge and employability skills was **76.71%**, which is **higher than the criterion** for a "Good" level (70% and above)

Grade Level	Average Score (%)	Interpretation
Grade 4 (N=3)	75.30	Higher than Criterion
Grade 5 (N=13)	76.66	Higher than Criterion
Grade 6 (N=9)	78.18	Higher than Criterion
Overall Average	76.71	Higher than Criterion

Table 3, the percentage scores of employability skills among students in Grades 4–6 at Ban Huai Pao Nuea School, compared with the "good" level criterion (70 percent or higher), were as follows: Grade 4 students had an average score of 75.30 percent, Grade 5 students had an average score of 76.66 percent, and Grade 6 students had an average score of 78.18 percent.

2.3 Students' Satisfaction with the Place-Based Education Program to Enhance Employability Skills of Grade 4–6 Students at Ban Huai Pao Nuea School

The place-based education program using hydroponic vegetable cultivation showed that students had the highest level of satisfaction with their learning, with a mean score of 4.54.

Table 4 Students' Satisfaction with the Place-Based Education Program to Enhance Employability Skills (N=25)

Item	Mean	S.D	Interpretation
Domain 1: Learning Content and Activities			
1. Clarity and comprehensibility of program content	4.8	0.45	Highest
2. Appropriateness of content for students' grade level	4.6	0.55	Highest
3. Variety of learning activities	4.2	1.30	Highest
4. Interest and attractiveness of activities	4.6	0.89	Highest
5. Appropriateness of hands-on activities	4.6	0.55	Highest
6. Fun and engagement in activities	5.0	0.00	Highest
7. Alignment of content with future employability skills	4.8	0.45	Highest
Domain 2: Learning Outcomes			
8. Development of teamwork and leadership skills	4.8	0.45	Highest
9. Development of problem-solving and adaptability skills	4.0	0.71	Highest
10. Development of technological skills	4.4	0.55	Highest
11. Increase in knowledge and interest in local tourism and culture	5.0	0.00	Highest
12. Development of empathy and helping others	4.6	0.55	Highest
13. Awareness and self-care for health	4.2	0.84	Highest
14. Development of foreign language communication skills	3.0	1.00	Moderate
15. Application of knowledge and skills from the program to real life	4.6	0.55	Highest
Domain 3: Teaching Management			
16. Clarity in explaining content and activity procedures	4.2	0.84	Highest
17. Appropriateness of teaching materials and equipment	4.8	0.45	Highest

Item	Mean	S.D	Interpretation
18. Teacher guidance and assistance during learning	4.6	0.55	Highest
19. Promotion of equitable student participation	5.0	0.00	Highest
20. Inspiration and motivation for continued learning	5.0	0.00	Highest

Conclusion, Discussion, and Recommendations

1. Conclusion

Program Design: The Place-Based Educational Program integrating hydroponics was found to be at a Very Good level of suitability ($\bar{x}$ = 83.33%).

Program Effectiveness: After using the program, students achieved employability skills scores at a Good level ($\bar{x}$ = 76.71%) and expressed Highest satisfaction ($\bar{x}$ = 4.54)

2. Discussion

The program effectively enhanced students' essential employability competencies through experiential learning, focusing on life and career skills. The program serves as an effective guideline for developing career and life skills in future educational practices

3. Recommendations

For Implementation: The research was a pilot test at Ban Huay Pao Nuea School; further application should consider local context. For Future Research: Hydroponics allows for the cultivation of various types of vegetables; future studies should investigate factors that promote the growth of each specific type of vegetable.

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