

# Effectiveness of the project-based learning program on Thai nursing student competency for elderly care in the community

Effectiveness  
of PjBL on  
Thai nursing  
student

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## Abstract

**Purpose** – The purpose of this study is to examine the effectiveness of the Thai nursing student competency enhancement program applied through project-based learning (PjBL) in caring for the elderly in the community.

**Design/methodology/approach** – This quasi-experimental one-group pre-post-test design was used to compare mean scores on gerontological nursing competency scales comprising four dimensions including holistic health promotion, empirical evidence, empowerment and quality care and ethical and moral competencies. A total of 95 participants were randomly selected from a list of registered attendees. A five-week PjBL approach for a community nursing practicum was designed and comprised of an introduction to the project, components of research methodology, group projects and group presentations. A gerontological nursing competencies questionnaire was used with participants, and data were analyzed using descriptive statistics. Two-way ANOVA and a paired *t*-test were used to compare pre-post mean scores of competencies.

**Findings** – A total of 95 students participated in the PjBL and the majority of participants were female (92.6%). The results revealed post-PjBL mean scores of gerontological nursing competencies were higher than the premean score (*p* value < 0.05) except the empirical evidence competencies which showed no statistical difference.

**Originality/value** – Since the results show the effectiveness of the student nursing competency enhancement program through PjBL when caring for the elderly in the community, it is important for health care instructors to apply PjBL, especially in community nursing. Improving empirical competency evidence among nursing students is still required and necessary.

**Keywords** Thai community, Elderly care, Nursing competencies, Project-based learning program

**Paper type** Research paper

## Introduction

Increasing emphasis on the health of the aging Thai population requires a reframing and updating of the knowledge and skills of nursing professionals [1]. Nursing students can be

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expected to provide care to significant numbers of elderly persons, not only during their clinical practicum but also when working in the field [2]. It is important that nursing students learn and become proficient in gerontological competencies when caring for the elderly in the community [3]. Nursing curricula and faculty can play a significant role in fostering the development of applicable competencies toward elderly care [4].

Competency in caring for the elderly, especially in a community, is an important component of nursing practice [5]. Since health care expenses are increasing, community-based nursing programs should be considered in order to reduce costs [6]. The challenge is to explore teaching tools that will equip students with knowledge and skills in preparation for their practices where they will experience caring for the elderly in various situations in the community [7]. The traditional teaching methods still focus heavily on theoretical content, while translating theory into active teaching and learning practice has been more difficult [8]. Competencies in caring for the elderly in the community, are not being utilized within a real-world context such as participation and empowerment of the patient and family, comprehensive geriatric assessments and development, implementation and evaluation of a community project plan [8]. Therefore, a major concern of the academic faculty members involved in geriatric care in the community is the use of an effective and appropriate teaching approach [7].

Based on a constructivist background, the project approach represents a student-centered pedagogy [9]. Currently, project-based learning (PjBL) is more frequently found in higher education which challenges students and provides them with learning experiences relevant to the 21st century [10]. The significant educational potential of constructivist teaching-learning strategy recognizes the influence of social issues and requires nursing education to include classroom teaching in areas of community-based projects [6]. PjBL has been an acceptable learning process that begins with the pursuit of knowledge, thought processes and problem-solving skills. This learning style includes improving competencies implemented in community projects [7]. PjBL has been widely used among nursing students to help improve reflective thinking behaviors [11], to improve nursing core competencies including critical thinking, clinical care, leadership, interpersonal relationship and ethical practice [12] and to help improve thinking about morals and ethics, while increasing knowledge levels [13]. Even though some studies showed that competency-based learning among nursing students' skills such as midwifery competencies [14] and cultural competency [15] have been tested, specific testing for the effectiveness of PjBL on gerontological nursing competencies when caring for the elderly in the community has not been examined – in spite of an aging Thai society needing nurses who have gerontological competencies [3].

Due to the low numbers of nurses trained in geriatric care in Thailand, nursing students are required to learn specific competencies based on societal needs in preparation for their adequate care [16]. The basic theoretical concepts of nursing competency development consist of holistic health promotion, use of empirical evidence, empowerment and quality care and ethical and moral competencies [17].

Competence in holistic health promotion assumes the ability to provide nursing care for the whole person. Such care includes a balanced approach in promoting physical, mental, and spiritual health during illness, disability and until death while maintaining a patient's peace and dignity and minimizing suffering [18]. This study of holistic health promotion competencies for nursing students focuses on the student nurse's ability to encourage the elderly to assess their own health condition independently, work together in finding solutions to health problems, design and organize activities according to the needs of the elderly and willingly participate in health promotion activities.

The empirical evidence competency is implemented by incorporating evidence from the best research studies, the use of expertise in each field and identifying patient needs and information [8]. The US Association of American Nursing Colleges concluded that the competencies needed for elderly nursing care should be integrated with the nursing

curriculum in teaching nursing students to use evidence-based practice [19]. Nurses are required to have the ability to follow and collect research results or evidence relevant for use in caring for the elderly [8]. The use of empirical evidence leads to the development of quality nurses providing excellent care. By utilizing nursing practice guidelines and dissemination of nursing practices guidelines, it enhances sharing nursing knowledge [20].

The competency of empowerment and quality care is a social process showing acceptance and appreciation (recognition), promoting and enhancing the ability of the person to meet their needs and creating a feeling that they can control the problem by themselves using existing resources [21, 22]. A nurse's role is to help the elderly with health screening, accessing services, educating and empowering self-care reliance for them and their families [23]. In particular, nursing interventions need to empower the elderly to take care of themselves and reduce dependence on other people [18]. High-quality geriatric care is composed of nursing with positive attitudes toward caring for the elderly, integration of real-life learning experiences and knowledge and focusing on gaining and creating new knowledge [24].

The ethical and moral competencies are elements reflected in the quality of care provided to the elderly when they are in a physically deteriorated condition [1]. Therefore, it is important to consider their rights and ethical principles when caring for them [17]. Competent nursing care for the elderly must include respecting human dignity under the following six ethical principles: (1) autonomy; (2) beneficence; (3) non-maleficence; (4) justice; (5) veracity/telling truth and (6) fidelity [20]. Ethics and law are one of the eight core competencies of general nurses who have graduated from a bachelor's degree program [19]. Application of ethical principles in decision-making, as a service representative, includes respecting the diversity of the elderly and their families, to include, gender, age, race, awareness of beliefs, cultures, ethnicities and the spirit of the elderly [17].

In order to develop the competencies of nursing students at the undergraduate level to care for the elderly in the community, PjBL will provide students with work experience and an understanding of how the system works in real life [13]. PjBL promotes lifelong learning in accordance with the theory of learning [13]. Learning is carried out by using such projects results in students gaining knowledge, experience, training, cognitive and social skills and increased confidence and self-esteem [25].

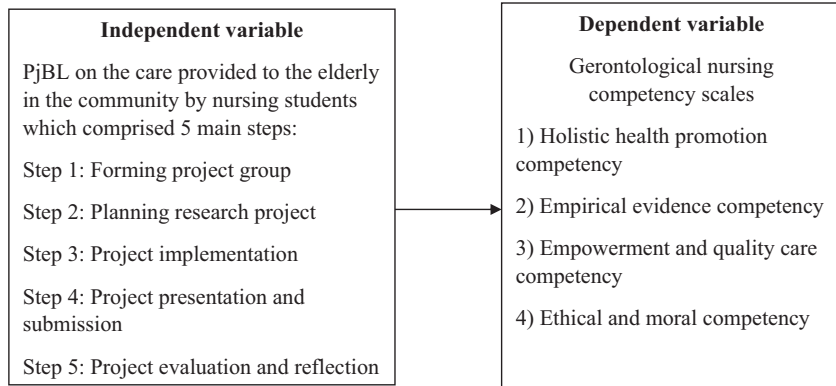
In this study, PjBL is consistent with the nursing process. The first process is in the assessment of issues, analyzing secondary data from the community and reviewing various related theoretical concepts. The second process involves assessing community feasibility of the project, any available resources and the process of exchanging assessed information with the community in order to identify problems. The third process is to prioritize the problems identified. The fourth process is the implementation and evaluation of the project. The last process is the sharing of information through various media sources such as video clips, online text, YouTube, etc.

This study was conducted to identify the effectiveness of a nursing student competency enhancement program applied through PjBL in caring for the elderly in the community.

## Methodology

*Design:* a quasi-experimental study showing the effectiveness of a nursing student competency enhancement program as applied through PjBL in caring for the elderly in a community (see Figure 1).

*Setting:* A field study of community nursing practicum for fourth-year nursing students in four rural communities in Nakhon Ratchasima Province, Thailand. Nakhon Ratchasima province has the highest number of elderly residents in its overall population compared to other rural areas of Thailand and was selected as the subjective area [26]. Multistage random



**Figure 1.**  
Theoretical framework  
of the study

sampling was then used to select the study population using the following steps. Firstly, one district was selected out of 32 districts in the selected province. Secondly, one subdistrict was selected from the district. Finally, four villages were selected from the subdistrict. The reason for selecting a rural community area for this study was that the majority of elderly persons in Thailand live in rural areas where the health services given by specialized gerontological nurses are still limited. Nurses who work with people in rural areas need to have gerontological competencies, therefore this study examined the PjBL for developing the gerontological nursing competencies among nursing students who will potentially work in rural areas.

*Sample:* The participants were 95 undergraduates in the first semester of their fourth year of nursing study in the 2018 academic year in Nakhon Ratchasima Province, Thailand.

*Inclusion criteria:* The criteria for including participants in this study were:

- (1) Fourth-year nursing student participants aged 18 years or more
- (2) Studying community nursing theory
- (3) Enrolled for the community nursing practicum
- (4) Willing and able to participate in the study

*Exclusion criteria:* Nursing students who had not studied any community nursing theory.

*Inclusion criteria for Instructors* were as follows: Instructors had to have worked in the teaching area for at least one year and have experience of working in a community project.

*Materials:* Material on research methodology was prepared, and the first sensitization workshop was completed with the instructors of the community nursing department. They were introduced to the concept of PjBL, the process of identifying problems and of the various components of research methodology skills, group dynamics, communication skills, its assessment and the possible utility for the students and instructors.

The use of PjBL aimed to help students understand and apply the components of research methodology, to assess improvement in student skills, group dynamics, team-based learning, analytical skills, project presentation and report writing about their project work in the community field.

The students were divided into 13 groups, each with an instructor. Participants were grouped by roll number and each group had seven to eight members. The students were oriented to the PjBL model and the components of research methodology skills in interactive

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classes and with suitable examples. Informed consent was taken from students. After that, they worked in their groups using group dynamics and wrote out their individual projects with their instructor.

### **Main steps in the PjBL approach**

#### Step 1: Forming project group (first week)

- (1) The concepts of PjBL were explained along with the components of research methodology skills. Preparing the project group was achieved by teaching the general principles of community health nursing processes. Instructors outlined and carried out a preliminary study focused on geriatric health issues in the community.
- (2) Community assessment with instructors included performing walk through visits together with students. Instructors assessed student interests so they could motivate them to get involved in the learning process.
- (3) Students assessed information about the elderly in the community including physical, mental and environmental health issues and social engagement. This activity developed student's competency in geriatric assessment and the use of assessment tools such as the Barthel Activities of daily living (ADL) index, Thai Geriatric Depression Scale, elderly health profile, long-term care, health literacy, etc. The data were analyzed and presented to instructors.
- (4) Instructors led students in brainstorming possible health problems and then put together a list of elderly health problems in the community.
- (5) Students gave the feedback to the community and set priorities based on the most important issues that the elderly in their community wanted to improve upon.

#### Step 2: Planning research project (second week)

- (1) Introduction to group projects and elderly problem issues were selected in each group, scoping the topic and defining learning goals. Students were challenged to creatively solve a problem in their groups.
- (2) Student groups generated a list of objectives, questions and hypotheses. Instructors assisted student groups in planning for tasks they would perform and how they would work together.
- (3) Participation in project planning with community networks and stakeholders using the participatory learning process. As the students worked on their projects, instructors encouraged groups to regularly review how well they were collaborating, communicating and using technical aids.
- (4) Students reviewed the literature on processes/solutions/methods/techniques and tools for improving the health conditions of the elderly in the community. They also identified the materials and tools for evaluating the project.

#### Step 3: Project implementation (third week)

Determining activities and tasks, design and data collection and determining due dates. Students worked on group projects and met regularly throughout the academic semester to work on a series of predefined projects. The students also had access to communities to implement projects and were encouraged to consult each other, instructors and health care professionals who were responsible for caring for their communities.

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#### Step 4: Project presentation and submission (fourth week)

Students worked on group projects and listened to keynote lectures. Each group presented the progression of their work. Instructors guided students and led discussions during regular meeting sessions in the communities. Formative and summative evaluations were performed through oral presentations and a written essay. Instructors coached students in preparing and presenting their projects.

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#### Step 5: Project evaluation and reflection (fifth week)

Group presentations and course feedback. At the end of the course, each group was required to prepare and submit a final report detailing the research and development process and conclusion. Their PjBL experience was evaluated through the pre-post tools of each project and then evaluated by peers and instructors.

*Measures:* Closed survey questions were used for gender, age, income and having had experience of elderly care in the family. The gerontological nursing competencies questionnaire included the following four competencies: (1) holistic health promotion (14 indicators), (2) using empirical evidence (8 indicators), (3) empowerment and quality care (11 indicators) and (4) ethical and moral competencies (8 indicators). This scale has been used in several studies to assess the gerontological nursing competencies of college and nursing students in Thailand [10, 11]. Questions were answered on the 5-point Likert scale ranging from 5 (strongly agree) to 1 (strongly disagree). Higher scores indicated higher gerontological nursing competencies. The Cronbach's alpha for the gerontological nursing competencies questionnaire was 0.78 for the present study.

*Recruitment and data collection procedures:* After Maharat Nakhon Ratchasima Hospital Institutional Research Board had granted approval (IRB No. 050/2018), this study was then conducted at a nursing faculty in Thailand. Participants were randomly selected from a list of registered attendees by a researcher who was not involved in data collection and analysis. Prior to data collection, participants were informed of the objective of this study, data collection process and time to use for data collection. Additionally, they were informed of their right to decline or to withdraw from this study at any time and for any reason. Written consent forms were obtained from participants prior to data collection. There was no harm or risk in participating in this study and anonymity was maintained. After reading the informed consent form, those who volunteered to participate answered the survey questions anonymously. The self-reporting, paper-based pretest and post-test of the gerontological nursing competencies survey took approximately 30 min to complete. Researchers set the measuring time schedule which did not interrupt the learning process. Researchers minimized the bias of instructors by reviewing the projects at a number of stages in development to ensure that each was of appropriate clarity and depth and provided sufficient opportunity for the development of gerontological competencies. Instructors were allowed flexibility, and each project was approached in a slightly different manner. This enabled mentors to better cater to the heterogeneous topics on offer and to the differences in the participants' prior knowledge.

*Analyses:* A Statistical Package for the Social Sciences (SPSS) 23.0 was used for data analysis. Descriptive statistics were calculated to describe the demographic characteristics and other backgrounds of the participants. Two-way ANOVA was used for differences between groups of participants. Characteristics included gender, age, income, experience of elderly care and cumulative grade (grade point average (GPA)) on gerontological nursing competencies scales. Then the subscale and total scales were presented. To compare the data between pre- and post-test for the scale of gerontological nursing competencies, a paired *t*-test was used.

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## Results

A total of 95 students from the first semester participated in the PjBL; 88 (92.6%) of them were female and the remaining seven (7.4%) were male. The average participant age was 22.91 (SD 3.12), their average income per month 5827.37 (SD 2055.17) (about US\$ 183.43 ), and almost half (49.5%) of them had experience with elderly care in their own families. Participants had a cumulative GPA of 2.93 (SD 0.40).

Analyses variance of the group (participants' general characteristics) by time pre- and post-PjBL were then run for all gerontological nursing competencies scale and subscales. The results in all analyses showed no significant interaction term, which meant there were no differential improvements in competencies according to gender, age, experience of elderly care, income and GPA. Only the subscale on empowerment and quality care competencies showed statistically significant interaction terms, which suggests a differential improvement in this subscale according to who already had experience of elderly care. See [Table I](#).

There was a significant PjBL effect as shown only in the group for income on the total and the subscales of gerontological nursing competencies, which suggests a differential improvement in all competencies scales according to income ([Table I](#)).

Analyses were conducted using a paired *t*-test on change in gerontological nursing competencies scales. The results revealed that postmean total scales on gerontological nursing competencies were statistically higher than the premean score ( $p$ -value < 0.05), [Table II](#).

By comparing the mean scores of the subtotal gerontological nursing competencies scales, this study showed significant positive effects that prior PjBL had on the following competencies: holistic health promotion ( $p < 0.011$ ), empowerment and quality care ( $p = 0.001$ ) and ethical and moral competencies ( $p < 0.001$ ). However, there were no significant effects on using empirical evidence competencies ( $p = 0.297$ ), [Table II](#).

## Discussion

The characteristics of participants, including gender, age, experience of elderly care and GPA grades, showed no significant interaction term on total and subscales gerontological nursing competencies, but all characteristics had different effects by time, meaning that all scales were improved by PjBL. This may be because PjBL allowed students to apply their ideas while engaging in real-world activities with elderly patients and then through investigating any questions, hypotheses, having discussions and then developing solutions [10]. Participants had the same level of interest in learning, and their characteristics were very similar as they were all in the same batch. This result confirmed that any changes in scales came from PjBL. Only the subscale on empowerment and quality care competencies showed statistically significant interaction terms, meaning there were differential improvements in this subscale according to who had experience of elderly care. This occurred because learners in a project-based approach take an active role in their own learning and are evaluated on the production of learning artifacts that reflect the ability to apply theory to practice. Therefore, the participants who had experienced elderly care had more self-confidence and easily put their own experience into practice than those who had no experience of elderly care.

This study showed that only income had a significant PjBL effect by group on total scales and subscales of gerontological nursing competencies. This result is consistent with previous studies that indicated the effect of income on student learning outcomes and behaviors i.e. prospective college students from low socioeconomic status backgrounds are less likely to have access to informational resources about college. Additionally, low socioeconomic status and exposure to adversity are linked to decreased educational success [27, 28].

The results revealed that postmean total scales on gerontological nursing competencies were statistically higher than the premean scores. These results are consistent with literature

Gerontological nursing competencies	Group	Pretest	Post-test	Group	Time ANOVA <i>F</i> ( <i>p</i> -value)	Group × time
		$\bar{X}$ (SD)	$\bar{X}$ (SD)			
Total score (scores 42–210)	<i>Gender</i>			0.001 (0.970)	2.829 (0.094)	0.081 (0.776)
	Male	175.14 (25.26)	185.14 (20.87)			
	Female	176.78 (19.82)	183.89 (15.81)			
	<i>Age</i>			1.929 (0.148)	6.388 (0.012)*	1.388 (0.252)
	20–25	177.10 (19.63)	183.43 (16.28)			
	26–30	182.60 (20.13)	193.00 (9.19)			
	≥31	154.00 (27.51)	185.00 (19.97)			
	<i>Experienced in elderly care</i>			0.003 (0.954)	7.582 (0.006)*	2.123 (0.147)
	Yes	178.53 (21.28)	181.96 (15.55)			
	No	174.83 (18.93)	185.96 (16.54)			
	<i>Income</i>			5.470 (0.005)*	2.782 (0.097)	0.219 (0.803)
	3,000–5,000	173.76 (20.21)	179.96 (16.94)			
	5,001–10,000	180.13 (19.93)	188.51 (13.17)			
	≥10,001	187.50 (10.61)	204.00 (8.49)			
	<i>GPA</i>			0.779 (0.507)	4.277 (0.040)*	0.726 (0.538)
	2.01–2.50	179.90 (19.70)	181.00 (20.21)			
	2.51–3.00	173.20 (18.89)	183.68 (16.18)			
	3.01–3.50	181.09 (20.90)	184.93 (15.61)			
	3.51–4.00	173.50 (23.60)	185.88 (13.71)			
1. Holistic health promotion (scores 14–70)	<i>Gender</i>			0.024 (0.878)	2.893 (0.091)	0.295 (0.587)
	Male	57.43 (7.52)	61.57 (7.87)			
	Female	58.72 (7.11)	60.85 (5.98)			

**Table I.**  
ANOVA of time pre- and post-PjBL by participants' general characteristics (*n* = 95)

(continued)



Gerontological nursing competencies		Pretest	Post-test	Group	Time ANOVA <i>F</i> ( <i>p</i> -value)	Group × time	Effectiveness of PjBL on Thai nursing student
	Group	$\bar{X}$ (SD)	$\bar{X}$ (SD)				
2. Using empirical evidence (scores 9–45)	<i>Age</i>			2.647 (0.074)	4.521 (0.035)*	1.638 (0.197)	
	20–25	58.74 (6.81)	60.79 (6.13)				
	26–30	62.20 (7.56)	63.00 (4.53)				
	≥31	49.00 (9.64)	60.67 (8.62)				
	<i>Experienced in elderly care</i>			0.005 (0.943)	5.578 (0.019)*	0.778 (0.379)	
	Yes	59.09 (8.06)	60.51 (5.66)				
	No	58.17 (6.07)	61.29 (6.52)				
	<i>Income</i>			3.693 (0.027)*	2.817 (0.095)	0.314 (0.731)	
	3,000–5,000	57.79 (7.45)	59.72 (6.16)				
	5,001–10,000	59.62 (6.70)	62.15 (5.67)				
	≥10,001	61.50 (2.12)	68.50 (2.12)				
	<i>GPA</i>			0.694 (0.557)	3.09 (0.080)	0.939 (0.423)	
	2.01–2.50	59.91 (6.58)	60.18 (8.22)				
	2.51–3.00	57.39 (6.51)	61.09 (5.64)				
	3.01–3.50	60.34 (7.16)	60.93 (6.20)				
	3.51–4.00	56.75 (9.94)	60.75 (5.95)				
	<i>Gender</i>			0.000 (0.985)	0.461 (0.498)	0.050 (0.823)	
	Male	36.14 (5.49)	37.43 (5.13)				
	Female	36.49 (5.60)	37.14 (4.58)				
	<i>Age</i>			0.160 (0.852)	3.223 (0.074)	1.323 (0.269)	
20–25	36.56 (5.56)	36.95 (4.62)					
26–30	36.60 (5.86)	38.80 (4.32)					
≥31	33.33 (6.51)	40.33 (3.79)					

(continued)

Table I.

Gerontological nursing competencies	Group	Pretest	Post-test	Group	Time ANOVA <i>F</i> ( <i>p</i> -value)	Group × time
		$\bar{X}$ (SD)	$\bar{X}$ (SD)			
3. Empowerment and quality care (scores 11–55)	<i>Experienced in elderly care</i>			0.003 (9.59)	0.865 (0.353)	0.091 (0.763)
	Yes	36.60 (6.16)	37.06 (4.45)			
	No	36.33 (4.98)	37.25 (4.77)			
	<i>Income</i>			4.663 (0.011)*	0.817 (0.367)	0.165 (0.848)
	3,000–5,000	35.50 (5.19)	36.20 (4.88)			
	5,001–10,000	37.74 (5.98)	38.28 (3.84)			
	≥10,001	37.50 (2.12)	41.00 (5.65)			
	<i>GPA</i>			0.495 (0.686)	0.829 (0.364)	1.058 (0.368)
	2.01–2.50	37.00 (5.31)	36.09 (5.89)			
	2.51–3.00	35.64 (5.21)	37.16 (4.25)			
	3.01–3.50	37.59 (6.22)	37.03 (4.78)			
	3.51–4.00	35.75 (5.12)	39.13 (3.94)			
	<i>Gender</i>			0.054 (0.816)	3.314 (0.070)	0.047 (0.829)
	Male	47.00 (7.02)	49.85 (5.40)			
	Female	46.98 (5.23)	49.22 (4.67)			
	<i>Age</i>			3.324 (0.038)*	7.720 (0.006)*	1.308 (0.273)
	20–25	47.14 (5.25)	49.11 (4.71)			
	26–30	48.40 (4.72)	52.80 (2.28)			
	≥31	40.00 (5.19)	48.00 (6.08)			
	<i>Experienced in elderly care</i>			0.125 (0.724)	9.932 (0.002)*	5.415 (0.021)*
Yes	47.95 (5.28)	48.55 (4.79)				
No	46.02 (5.26)	49.98 (4.53)				

Table I.

(continued)

Gerontological nursing competencies	Group	Pretest	Post-test	Group	Time ANOVA	Group × time	Effectiveness of PjBL on Thai nursing student
		$\bar{X}$ (SD)	$\bar{X}$ (SD)		<i>F</i> ( <i>p</i> -value)		
4. Ethical and moral (scores 8–40)	<i>Income</i>			5.314 (0.006)*	3.873 (0.051)	0.461 (0.632)	
	3,000–5,000	46.26 (5.19)	48.06 (4.67)				
	5,001–10,000	47.87 (5.49)	50.69 (4.29)				
	≥10,001	49.00 (5.65)	54.50 (0.71)				
	<i>GPA</i>			0.785 (0.504)	5.254 (0.023)*	0.069 (0.976)	
	2.01–2.50	47.36 (5.63)	48.91 (4.97)				
	2.51–3.00	46.36 (5.64)	48.95 (5.03)				
	3.01–3.50	47.81 (4.66)	49.89 (4.62)				
	3.51–4.00	46.50 (6.28)	48.75 (4.13)				
	<i>Gender</i>			0.037 (0.848)	3.069 (0.081)	0.027 (0.870)	
	Male	34.57 (5.77)	36.29 (4.02)				
	Female	34.60 (4.39)	36.67 (3.11)				
	<i>Age</i>			1.183 (0.309)	5.214 (0.024)*	0.364 (0.695)	
	20–25	34.66 (4.41)	36.56 (3.19)				
	26–30	35.40 (3.78)	38.40 (1.81)				
	≥31	31.67 (7.50)	36.00 (4.00)				
	<i>Experienced in elderly care</i>			0.848 (0.358)	13.278 (<0.001)*	3.857 (0.051)	
	Yes	34.89 (4.48)	35.83 (3.31)				
	No	34.31 (4.47)	37.44 (2.82)				
	<i>Income</i>			4.093 (0.018)*	1.430 (0.233)	0.278 (0.757)	
3,000–5,000	34.20 (4.56)	35.98 (3.36)					
5,001–10,000	34.89 (4.31)	37.38 (2.67)					
≥10,001	39.50 (0.71)	40.00 (0.00)					

(continued)

Table I.

Gerontological nursing competencies	Group	Pretest	Post-test	Group	Time ANOVA <i>F</i> ( <i>p</i> -value)	Group × time
		$\bar{X}$ (SD)	$\bar{X}$ (SD)			
<i>GPA</i>				0.895 (0.445)	6.462 (0.012)*	0.704 (0.551)
	2.01–2.50	35.64 (3.90)	35.82 (3.57)			
	2.51–3.00	33.81 (4.71)	36.48 (3.37)			
	3.01–3.50	35.34 (4.29)	37.00 (2.88)			
	3.51–4.00	34.50 (4.44)	37.25 (2.65)			

**Table I.** Note(s): \*Statistically significant differences between pre- and post-test measures

Gerontological nursing competencies	Possible score	Pretest		Post-test		<i>t</i>	<i>p</i> -value
		Mean	SD	Mean	SD		
1. Holistic health promotion competencies	14–70	58.62	7.10	60.91	6.09	–2.578	0.011
2. Using empirical evidence competencies	9–45	36.46	5.56	37.16	4.59	–1.048	0.297
3. Empowerment and quality care competencies	11–55	46.98	5.33	49.27	4.70	–3.357	0.001
4. Ethical and moral competencies	8–40	34.60	4.46	36.64	3.16	–3.972	<0.001
<i>Total score</i> on gerontological nursing competencies	42–210	176.66	28.57	183.98	16.10	–3.084	0.003

**Table II.** Gerontological nursing competencies scores between pre- and post-PjBL (*n* = 95)

reviews that have shown that students who engage in PjBL develop their skills in independent learning and problem-solving. They learn to be more open-minded, retain what they learn longer and perform better on standard achievement competencies than non-PjBL students [11, 13].

The results showed that using empirical evidence competencies had no statistical difference. This is consistent with a recent survey of the state of evidence-based practice in nurses and indicated that, while nurses had positive attitudes toward evidence-based practice and wished to gain more knowledge and skills, they faced significant barriers in employing it in practice [29]. Particularly for undergraduates, using empirical evidence is needed for teaching, learning and developing quality care for the elderly by students [7]. Nursing instructors should use empirical evidence that has been continuously developed to evaluate problems and expectations of quality care for the elderly. It must be comprehensive and coordinate the management of care for the elderly for nursing effectiveness [8, 16, 17].

There are some limitations to this study. Firstly, due to a lack of a comparison group, the results possibly overestimated the competencies effects attributed to PjBL use. Secondly, there may be an element of subjectivity of the competencies effect based on the participant’s perception and judgment. Finally, the time given to students was short in duration. The strengths of this study, other than the apparent advantages of PjBL over traditional methods, is the beneficial evidence supporting its application outside of a traditional hospital setting. This study showed that student learning in terms of cognitive performance and competencies can be developed by PjBL.

In this study, instructor roles were to facilitate, give guidance and motivate their students. This paradigm change influences PjBL by not just simply teaching, but by enhancing learning by doing.

As the results have shown the effectiveness of PjBL, hospital nursing administrations would benefit from a plan to improve the gerontological competency for nurses by using a PjBL model, so that nurses can provide appropriate care to the elderly in the community. The government should designate authorities responsible for the elderly care in the community and utilize PjBL to plan health care services for them. Community health nurses should also be encouraged to learn PjBL skills to be able to perform elderly care in order to get participation from the community to identify risks and manage care appropriately for the elderly.

Future studies should focus on validating the effectiveness of a PjBL model under differing conditions and different student populations. It is likely that different aspects of out-of-hospital education are amenable to PjBL approaches, whereas others may be adequately taught using traditional methods.

## Conclusions

PjBL emphasizes students as subjects giving them opportunities to explore and discover knowledge. This study identified the effectiveness of PjBL on the quality of care provided to the elderly in the community by nursing students. Students provided with (PjBL) opportunities will be better able to approach and care for the elderly in the community. Instructors could suggest learning tasks that focus on a specific set of objectives and key concepts as well as articulate a set of outcomes for learners to take care of the elderly in the community. Students will be better prepared for the workforce, as it pertains to caring for the elderly in the community, by using PjBL.

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