



# Instructional Approaches to Enhance Health Literacy of Health Science Students: A Mixed-Methods Research Synthesis

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## Abstract

The strategies development to enhance health literacy in health science students adopted from evidences is crucial. This research is to synthesize findings on quantitative, qualitative and mixed-methods studies published and unpublished from 2010 to 2019. The Mixed-Methods Research Synthesis (MMRS), that synthesized quantitative and qualitative findings, was conducted by a design of segregated Mixed-Methods Research Synthesis. The meta-analysis was applied to synthesize quantitative findings in quantitative and mixed-methods research whereas the meta-aggregation was applied to synthesize qualitative findings in qualitative and mixed-methods research. The results showed that the student-centered instructional method and interactive teaching method were the highest mean of effect sizes related to the recommendation of the usage of various methods to enhance health literacy. It was recommended that using technology and non-technology teaching materials and media could enhance health literacy among health science students. Appropriate approaches as instructional methods and media should be adopted to develop strategies for health literacy enhancement.

**Keywords:** Health Literacy, Health Science Students, Instructional Approach, Mixed-Methods Research Synthesis, MMRS

## Introduction

Health literacy is another global issue. Education is one of main factors that help promote people's literacy but probably not enough to achieve this aim. Knowledge and understanding of health, as well as use of health information, are factors that can promote the people's literacy and maintain their health (World Health Organization, 1998). Nowadays, the rapid change of social, politics, and economic situations have an effect to change people health behaviors in terms of health risks of injuries and diseases, but they can protect and improve their health if they can access, understand and apply health information to their lives (Bhutani & Bhutani, 2014). The promotion of people's health literacy to strengthen and improve their health is essential, and this is also important direct solution to solve any health problem and concern, together with sustainable ways and worldwide acceptances for solving health problems (Kaeodumkoeng, 2018; Nammontri, 2018).

Sciences on health literacy and studies on its meaning, component and development have resulted in an understanding and promotion of the field. This includes interventions, recommendations and guidelines in various aspects to reduce limitations and obstacles on health literacy promotion, efficiently and effectively, for target people. Healthcare workers, or professional healthcare providers, are considered as important members to receive health literacy promotion because they have health literacy and skills to communicate with people and implement clinical practices for health promotion, prevention, curation and rehabilitation. Moreover, such workers and providers can empower people or patients to ask questions, answer them and give health information that becomes correct, clear and sustainably applicable to health care (Indhraratana, 2014).

Today, various studies on health literacy in many countries, including quantitative and qualitative studies, are found, particularly in promoting health literacy studies to people and students in health science fields. There are

some studies that apply different approaches to promote health literacy i.e. programs, modules, processes and innovations. Nevertheless, no study summarizes or synthesizes methods for effective promotion on health literacy among health science students at the highest effect size. Likewise, regarding in-depth studies, there is no qualitative study on students' experiences, viewpoints or opinions in order to find methods appropriate and effective to health literacy promotion through specific and general findings. To solve this, the Mixed-Methods Research Synthesis (MMRS) is regarded as a method that can synthesize quantitative and qualitative findings. The MMRS synthesizes many issues such as studying health literacy promotion among the aforementioned group of students to obtain useful and consistent findings with actual situations, as well as answering general and specific research questions (Heyvaert et al., 2011). This leads to developing and designing interventions according to the evidence based on applicable principles. This study aims to synthesize knowledge of instructional approaches that enhance health literacy among health science students by using the Mixed-Methods Research Synthesis (MMRS). The secondary objectives of this research are to synthesize quantitative findings from quantitative and primary mixed-methods research on methods that enhance health literacy among health science students. The study used meta-analysis to synthesize qualitative findings from qualitative and primary mixed-methods research related to opinions and viewpoints of health science students on health literacy promotion with the meta-aggregation's method.

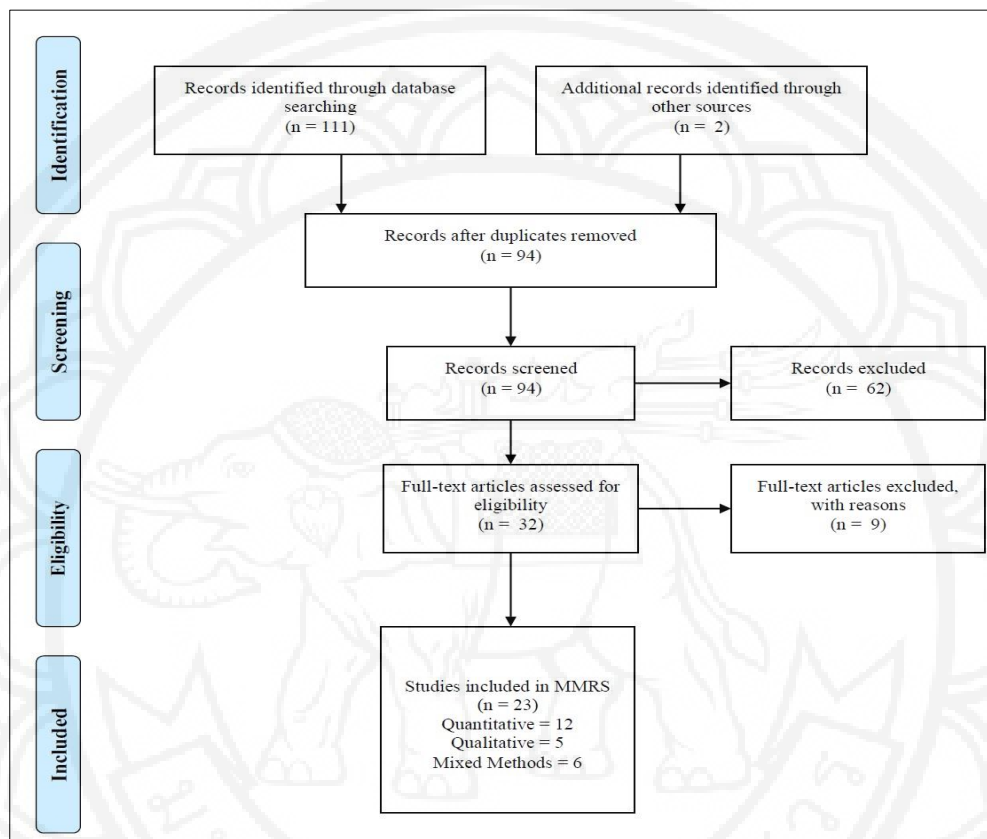
### Methods and Materials

In this research, the Mixed-Methods Research Synthesis (MMRS) was used for synthesizing instructional methods for promoting health literacy of health science students from quantitative and qualitative findings in the design of data synthesis for segregated Mixed-Methods Research Synthesis (Heyvaert et al., 2017). The synthesis was divided into two parts: 1) the meta-analysis, the synthesis of quantitative findings derived from quantitative research and quantitative part of primary mixed-methods research related to instructional methods for health literacy promotion among health science students; and 2) the meta-aggregation, the synthesis of qualitative findings derived from qualitative research and qualitative part of primary mixed-methods research on health literacy promotion that involved experiences, opinions and viewpoints of health science students. The resources were searched by using Thai and English keywords related to studied issues from 10 databases (i.e. PubMed, Science Direct, EBSCO, CINAHL, Springer Link, Scopus, ProQuest, Cochrane Library, ThaiJo and ThaiLIS). The documents, articles, research reports and theses in libraries were also searched. The back-tracking method was used in order to obtain additional literatures. The studies in this study, both published and unpublished, consisted of Thai and international research articles, research reports and theses that were primary research studies on health literacy. These studies were conducted with students in the health science field.

The research synthesis included quantitative research that had independent variables with the comparison of experimental and control groups. This includes randomized experimental studies with control groups, pre-experimental studies with pre-test and post-test groups, and quasi-experimental studies with qualities and variables about health literacy, according to the principle of Joanna Briggs Institute (n.d.): PICO; comprising of population; intervention; comparison and outcome. Regarding qualitative research, the principle of PICO consists of participants and phenomena of interest and context. Here, 111 primary research studies were identified systematically by searching across databases whereas two primary research studies were identified through hand-searching and back-tracking. The 19 duplicated primary research studies were removed. Then 94 titles and abstracts of primary researches were screened; the ineligible and irrelevant ones were excluded. The remain was



12 primary quantitative research studies, 5 primary qualitative research studies and 6 primary mixed-methods research studies. All were included to the Mixed-Methods Research Synthesis (MMRS) as shown in Figure 1. The instruments of this research were five research instruments of Joanna Briggs Institute (n.d.): initial screening form, inclusion criteria form, critical appraisal form, research characteristic record and data extraction form. This research was certified by Human Research Ethics Committee of Srinakharinwirot University (SWUEC-G-115/2562).



**Figure 1** The PRISMA Flowchart of Included Studies in Mixed-Methods Research Synthesis

## Results and Discussion

In this research, the results were divided into four sections. First, the summary of included studies and study quality was explained. Secondly, the section of quantitative synthesis results was described. Next, the qualitative synthesis results were presented and the mixed-methods synthesis results were finally shown.

### The Summary of Included Studies and Study Quality

In this research, 23 quantitative, qualitative and mixed studies were selected as shown in Figure 1. These studies included 12 quantitative studies, 5 qualitative studies and 6 mixed-methods studies. Most of the studies were conducted in the United States of America and Thailand in health science fields. To evaluate the qualities of the studies, the critical appraisal form of Joanna Briggs Institute (n.d.) was applied. The characteristics of included studies and the study quality appraisal's results was shown in Table 1.

**Table 1** Studies Characteristics

Characteristics	Number of Studies (n = 23)	References
<b>Type of Research</b>		
Quantitative Research	12	Devraj et al. (2010); McCleary-Jones (2012); Roberts et al. (2012); Ha & Lopez (2014); Bloom-Feshbach et al. (2016); Trujillo & Figler (2015); Dunkerley (2016); Mnatzaganian et al. (2017); Borrero (2018); Farokhi et al. (2018); Phongsakchat (2018); Nurash et al. (2019)
Qualitative Research	5	Scheckel et al. (2010); Shieh et al. (2013); Squellati (2013); Zanchetta et al. (2012); Weekes & Phillips (2015)
Mixed-Methods Research	6	Chen et al. (2013); Frazier (2012); Ross et al. (2013); Milford et al. (2016); Pearce et al. (2013); Sangkam et al. (2018)
<b>Year</b>		
2010 – 2014	11	Devraj et al. (2010); Scheckel et al. (2010); McCleary-Jones (2012); Roberts et al. (2012); Chen et al. (2013); Frazier (2012); Ross et al. (2013); Shieh et al. (2013); Squellati (2013); Zanchetta et al. (2012); Ha & Lopez (2014)
2015 – 2019	12	Bloom-Feshbach et al. (2016); Trujillo & Figler (2015); Weekes & Phillips (2015); Dunkerley (2016); Milford et al. (2016); Mnatzaganian et al. (2017); Borrero (2018); Farokhi et al. (2018); Phongsakchat (2018); Pearce et al. (2013); Sangkam et al. (2018); Nurash et al. (2019)
<b>Researchers' Field</b>		
Medicine	4	Roberts et al. (2012); Ross et al. (2013); Bloom-Feshbach et al. (2016); Milford et al. (2016)
Dentistry	1	Farokhi et al. (2018)
Pharmacy	6	Devraj et al. (2010); Chen et al. (2013); Ha & Lopez (2014); Trujillo & Figler (2015); Mnatzaganian et al. (2017); Pearce et al. (2013)
Nursing	8	Scheckel et al. (2010); McCleary-Jones (2012); Shieh et al. (2013); Squellati (2013); Zanchetta et al. (2012); Weekes & Phillips (2015); Borrero (2018); Sangkam et al. (2018)
Behavioral Sciences	1	Nurash et al. (2019)
Education	3	Frazier (2012); Dunkerley (2016); Phongsakchat (2018)
<b>Samples' Field</b>		
Medicine	5	Roberts et al. (2012); Frazier (2012); Ross et al. (2013); Bloom-Feshbach et al. (2016); Milford et al. (2016)
Dentistry	2	Farokhi et al. (2018); Nurash et al. (2019)
Pharmacy	6	Devraj et al. (2010); Chen et al. (2013); Ha & Lopez (2014); Trujillo & Figler (2015); Mnatzaganian et al. (2017); Pearce et al. (2013)
Nursing	10	Scheckel et al. (2010); McCleary-Jones (2012); Shieh et al. (2013); Squellati (2013); Zanchetta et al. (2012); Weekes & Phillips (2015); Dunkerley (2016); Borrero (2018); Phongsakchat (2018); Sangkam et al. (2018)



Table 1 (Cont.)

Characteristics	Number of Studies (n = 23)	References
<b>Sample Size</b>		
< 10 Samples	1	Scheckel et al. (2010)
10 – 40 Samples	4	Squellati (2013); Zanchetta et al. (2012); Weekes & Phillips (2015); Milford et al. (2016)
41 – 80 Samples	7	Devraj et al. (2010); Shieh et al. (2013); Dunkerley (2016); Mnatzaganian et al. (2017); Farokhi et al. (2018); Phongsakchat (2018); Nurash et al. (2019)
81 – 120 Samples	3	Ha & Lopez (2014); Bloom-Feshbach et al. (2016); Pearce et al. (2013)
> 120 Samples	8	McCleary-Jones (2012); Roberts et al. (2012); Chen et al. (2013); Frazier (2012); Ross et al. (2013); Trujillo & Figler (2015); Borrero (2018); Sangkam et al. (2018)
<b>Critical Appraisal Scores</b>		
100%	13	Scheckel et al. (2010); Roberts et al. (2012); Squellati (2013); Zanchetta et al. (2012); Bloom-Feshbach et al. (2016); Trujillo & Figler (2015); Weekes & Phillips (2015); Dunkerley (2016); Mnatzaganian et al. (2017); Borrero (2018); Farokhi et al. (2018); Phongsakchat (2018); Nurash et al. (2019)
85 – 99%	9	Devraj et al. (2010); Chen et al. (2013); Frazier (2012); Ross et al. (2013); Shieh et al. (2013); Ha & Lopez (2014); Milford et al. (2016); Pearce et al. (2013); Sangkam et al. (2018)
< 85%	1	McCleary-Jones (2012)

### Quantitative Synthesis Results

The synthesis of the quantitative findings was derived from the quantitative research and the quantitative part of primary mixed-methods research with the analysis of variances by comparing the means of the effect sizes according to each variable. It was found that the studies with the use of student-centered instructional methods had the highest mean of effect sizes ( $\bar{d} = .984$ , S.D. = .456) significantly ( $F = 5.422^*$ ,  $p = .014$ ), followed by the studies without the use teacher's instructional methods ( $\bar{d} = .770$ , S.D. = .494) and the teacher-centered methods ( $\bar{d} = .278$ , S.D. = .208), respectively. The teaching methods' mean of effect sizes indicated that the interactive teaching had the highest mean of effect sizes ( $\bar{d} = 1.043$ , S.D. = .478), different from other teaching methods significantly ( $F = 3.980^*$ ,  $p = .026$ ), followed by the individual study ( $\bar{d} = .770$ , S.D. = .409), experiential teaching ( $\bar{d} = .767$ , S.D. = .347) and direct instruction ( $\bar{d} = .278$ , S.D. = .208), respectively. However, the teaching materials, technologies and non-technologies teaching materials were different from the means of the effect sizes non-significantly ( $t = .576$ ,  $p = .572$ ). The means of the effect sizes, according to technologies and non-technologies teaching materials, revealed that the non-technologies teaching materials had higher mean of effect sizes ( $\bar{d} = .926$ , S.D. = .507) than the technologies teaching materials ( $\bar{d} = .765$ , S.D. = .502). Likewise, the types of teaching media's mean of the effect sizes were different non-significantly from the hardware, software and online teaching media ( $F = .589$ ,  $p = .565$ ): the hardware teaching media's mean had the highest mean of effect sizes ( $\bar{d} = .926$ , S.D. = .507), followed by the software ( $\bar{d} = .891$ , S.D. = .590), and online teaching media ( $\bar{d} = .623$ , S.D. = .367), respectively.





### Qualitative Synthesis Results

The results of synthesizing qualitative findings, derived from the qualitative research and the qualitative part of primary mixed-methods research with the content analysis and hierarchical tree structure methods (Heyvaert et al., 2017), showed two major themes as follows:

1. The usage of various methods to enhance health literacy was aggregated from the findings given by students who applied various strategies to inform patients (Chen et al., 2013), and the scope of health teaching practice (Zanchetta et al., 2012), as described below:

*“The key aspects of reducing the grade level were shortening the sentences and using smaller words. I (student) broke up a lot of the longer sentences containing side effects to watch for or reason not to use the drug into lists to make it easier on the eye and less intimidating for the patient to read. I (student) used shorter words that meant the same thing as some of the larger words when I (student) could. When I (student) came across a medical term that would be difficult for the patient to understand, I (student) explained what it was in everyday terms in place of the actual term.”*

(Chen et al., 2013)

2. The learning management to enhance health literacy was aggregated from the findings of how the promotion of health literacy curriculum in medical school was addressed (Frazier, 2012) and the point of introduction health literacy in BSN program (Squellati, 2013). As one student said, *“coursework to promote health literacy begins in the first year of medical school training with consecutive coursework in the second year, additionally, both promotion and hands on experience was reinforced during years 3 and 4”* (Frazier, 2012).

3. Many interactive learning methods were used to enhance health literacy among health science students, for example, in-class discussion, demonstration and teach-back (Shieh et al., 2013), clinical rotation (Squellati, 2013), practice and feedback (Frazier, 2012). As one student mentioned, *“the BSN students lead in using the technique of teach-back and The BSN students facilitate learning by using return demonstrations”* (Squellati, 2013).

4. Several integrated learning methods were used to enhance health literacy among health science students: promoting engagement (Scheckel et al., 2010), collaborating with experts (Shieh et al., 2013) and integration within patient education (Squellati, 2013). A student pointed out that *“I (student) suggested to the patient’s mother to attend asthma education provided by respiratory therapy. I (student) offered to go with her, so I (student) could learn more and help the patient understand many confusing areas discussed in the session”* (Shieh et al., 2013).

5. Technology and non-technology teaching materials included informative and entertaining animation (Pearce et al., 2013), written information (Shieh et al., 2013) and methods of ensuring patients to understand what was the most valuable (Squellati, 2013). As one student mentioned, *“Usage of supplementary materials such as pamphlets to support the lessons and information being conveyed to the patients (i.e. discharge instructions and materials)”* (Squellati, 2013).

### The Mixed-Methods Synthesis Results

To synthesize the quantitative and qualitative studies, the quantitative and qualitative findings were compared in Table 2.

**Table 2** The Mixed-methods Synthesis Results

Findings	Synthesis Results	
	Quantitative Synthesis Results	Qualitative Synthesis Results
<b>Instructional Methods</b>	The student-centered instructional methods had the highest mean of effect sizes ( $\bar{d} = .984$ , S.D. = .456) significantly ( $F = 5.422^*$ , $p = .014$ )	- The usage of various methods to enhance health literacy
<b>Teaching Methods</b>	The interactive teaching had the highest mean of effect sizes ( $\bar{d} = 1.043$ , S.D. = .478) difference from the other teaching methods significantly ( $F = 3.980^*$ , $p = .026$ )	- The learning management to enhance health literacy - The interactive learning methods - The integrated learning methods
<b>The Teaching Materials</b>	The technology and non-technology teaching materials were different of the means of the effect sizes non-significantly ( $t = .576$ , $p = .572$ )	The technology and non-technology teaching materials
<b>The Types of Teaching Media's</b>	the types of teaching media's mean of the effect sizes were different non significantly from the hardware, software and online teaching media ( $F = .589$ , $p = .565$ )	

The synthesized results of the primary quantitative studies were used as the basis and generalized with the synthesized results of the primary qualitative studies. The mixed-methods results showed the instructional methods and the teaching methods. The quantitative synthesis results revealed that the student-centered instructional methods had the highest mean of effect sizes significantly ( $F = 5.422^*$ ,  $p = .014$ ). The interactive teaching had the highest mean of effect sizes, different from the other teaching methods significantly ( $F = 3.980^*$ ,  $p = .026$ ). This is related to the qualitative synthesis results that recommended the usage of various methods to enhance health literacy i.e. using the learning management, interactive learning method and integrated learning method. According to Preston (2007), students taught with student-centered instruction had statistically significant higher achievement than those who were taught with teacher-centered instruction. Similarly, as Bruselius-Jensen et al. (2017) state, the methods that attract interest and participation of the students such as discussion or interactive methods, can enhance the critical health literacy. Likewise, Bernard et al. (2019) provide a strong evidence from their systematic review and meta-analysis that student-centered instruction leads to improvement in learning and that the efficacy of student-centered instruction allows students to engage in active learning. According to Saunders et al. (2019), the systematic review shows the best practice of training methods of health literacy such as integrative approaches and multiple training episode. As McCleary-Jones (2016) states, multiple teaching strategies on health literacy promotion cultivated in the nursing curricula are recommended to enhance health literacy of nursing student.

In terms of teaching materials and medias, the quantitative synthesis results showed that technology and non-technology teaching materials were different of the means of the effect sizes non-significantly ( $t = .576$ ,  $p = .572$ ). The types of teaching media's mean of the effect sizes were different non-significantly from the hardware, software and online teaching media ( $F = .589$ ,  $p = .565$ ). This is related to the qualitative synthesis results that recommended both technologies and non-technologies teaching materials to enhance health literacy. According to Choeisuwan (2017), using teaching media such as pictures, model, video, cartoon, publishing and electronic with explanation and teaching, was recommended to enhance health literacy. Likewise, Matsee & Waratwichit (2017) state that the effective communication with appropriate media and materials can enhance health literacy at an individual and organizational level. Moreover, the systematic review results of Kim & Xie



(2017) show that the effects from the use of websites or online apps on health literacy was founded in nine intervention studies, including positive effects on knowledge of health conditions via using computers and websites. Moreover, Wang et al. (2018) state that health education and teaching media could contribute to knowledge, improve behaviors of students significantly and increase patients' health outcome (Paterick et al., 2017). The understanding of their behaviors gives a positive effect to the perception on student capacity and competence (Brenner et al., 2016). As Fawaz & Anshasi (2019) revealed, students perceive that practice and interprofessional simulation-based education, together with various teaching materials and simulations, can develop their capacity, including personal and interpersonal skills.

### Conclusion and Suggestions

In this study of Mixed-Methods Research Synthesis (MMRS), the findings of primary quantitative and qualitative studies were analyzed with other mixed-methods studies. This research provided instructional approaches to enhance health literacy among health science students. The Mixed-Methods Research Synthesis results show that instructional methods with student-centered and interactive instruction had the highest mean of effect sizes significantly, related to the qualitative synthesis results that recommended the usage of various methods to enhance health literacy. The teaching materials and media, including technology and non-technology teaching materials, were different of the means of the effect sizes non-significantly according to the types of teaching media. Therefore, it was recommended that using both of the technologies and non-technologies teaching materials and media could enhance health literacy among the health science students.

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