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Review Articles

A Review of the Effectiveness of Information Literacy Instruction among Nursing Students

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Abstract

Information literacy is an essential skill for nurses to find evidence-based practice to improve nursing care. Many nursing schools are teaching information literacy to imbed this skill to their student. There is no evidence that showed the best way to teach information literacy. The purpose of this study was to review effective instruction to teach information literacy in undergraduate nursing students for the past 10 years by using PICO to define keywords. The included research must provide instruction methods in nursing students, measurement of actual information literacy and student's information literacy must improve after enrolled. Searching results found 9 studies that met criteria. All matched evidence was assessed for validity, reliability, and feasibility for using the results of the study as a guideline for information literacy instruction in nursing students. The reviews found that most of them were collaborative instruction between nursing faculty and librarian. All of them were provided learning tasks, activities, and assignments to students. Some of them provided assistant and feedback for students' assignments. Students' information literacy was improved after teaching. A well-designed instruction method with appropriate learning tasks and tools is an effective way to teach information literacy. The findings from this review can be helpful for nursing education as a guideline for information literacy instruction. Nurse educators should select and design appropriate learning tools and activities to practice. Provide assistance and feedback for students' assignments to help students gain more understanding and information literacy ability.

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1. Introduction

In the Information age, there is much information spread worldwide using the internet. Many people search and update for information on any search engine through the internet in a quick way. Unfortunately, some believed that what they found is accurate even though the information is outdated or illogical, as we know in the news reported worldwide. Outdated and illogical information can cause misleading or miscommunication in every part of the community. Many countries worldwide believe that to overcome this problem, we must be information literate. To become literate people, an individual must realize when information is required to use and find it in a scholarly search engine. Then we must appraise that information and use it effective way. To become an information literacy skillful person, we need information literacy (IL) skills. (Doyle, 1992; Zurkowski, 1974)

The Institute of Medicine (IOM) released a report entitled *Health Professions Education: A Bridge to Quality in 2003*, which suggested that the essential competencies for health professions education are patient-centered care, quality improvement, multidisciplinary team, evidence-based practice, and informatics. (Barnard et al., 2005; Melnyk et al., 2008) Thus, the educational instructor must train their student to differentiate between fact and opinion to become an information literate person before they become a health professional.

Nurses are care providers whose quality of care needs to be up to date; thus, searching for information on the internet is the best way to find out. Moreover, nurses are the professions whose nursing care raises questions about the evidence supporting nursing care delivery. To ensure the quality of evidence of their search and adapt to nursing care, they must be an information literate nurse and follow the evidence-based nursing method. Thus, being an information literate nurse (especially in health information) is an essential skill that must be immersed in all nurse professions. Being information literate is a necessary skill for nurses to efficiently locate, search, and choose credible medical information to improve patient care and reduce healthcare costs. It can help nurses accurately evaluate and make the right clinical decision to solve the patient's problem.

IL instruction in the undergraduate nursing curriculum has been integrated from time to time. There are several methods (e.g., face-to-face, online, computer-assisted, web-based, and

blended instruction), but there is little information about which method is most effective for improving the IL ability. (Krobudom & Somprasertsri, 2018) Nevertheless, nursing schools can never directly meet all the expected outcomes of their graduated student, but faculty can ensure that their graduates can learn by themselves outside of formal education. Schools need to create generations of independent learners by equipping nursing students with the IL skills and encouraging them to improve their information literacy self-efficacy and skills after they finished the nursing informatics course or graduated. (Barnard et al., 2005; Greiner & Knebel, 2003; Melnyk et al., 2008)

Therefore, it is essential to know the best instruction method in other institutes to teach IL skills to undergraduate nursing students. The results of this may be evidence of supporting, improving teaching, and facilitating methods of IL instruction for nursing faculty. To enhance students to possess IL skills and use them in their work-life by effective IL teaching, this is the first step to prepare students for their professional role and autonomy of patient care.

2. Purpose

The objective was to review effective instruction to teach information literacy skills in undergraduate nursing students.

3. Methodology

The researcher performed the steps of systematic review as followed:

3.1 Search strategies

The PICO framework was used to construct a question and concept of “What is the most effective instruction method to teach information literacy skills in undergraduate nursing students” Therefore, PICO could be defined as follows:

1) Population: Undergraduate nursing student, baccalaureate nursing student, bachelor nursing student

2) Intervention: Teaching/instruction, instruction method, teach, teaching, training, tutorial

3) Comparison: No

4) Outcome: Information literacy skills/knowledge, computer literacy, bibliography skill/ knowledge, searching skill, bibliography literacy

3.2 Search databases

This step was searching research published in full text in English from electronic database as follows: Academic Search Complete, Nursing & Allied Health Database, MEDLINE, ScienceDirect, ClinicalKey for Nursing. All databases are provided with reliable healthcare information covering nursing, medicine, and much more.

3.3 Inclusion criteria

The study must be research conducted in a scientific method in which quantitative or qualitative research, provided instruction methods, and taught or conducted in undergraduate nursing (not Master and Doctoral of Nursing Science). The evidence must be in the field of instruction methods to teach information literacy and its components. The articles must be written in English and published since 2010 to 2021.

3.4 Exclusion criteria

Evidence that measured student IL by self-report or satisfaction of instruction instead of actual IL and provides instructions methods that are not related to information literacy competency.

3.5 Appraisal level of evidence

This step used the guideline provided by Melnyk and Fineout-Overholt (2011) to appraise and categorized included evidence into levels of evidence as follow:

Level I A meta-analysis or systematic review of all relevant randomized control trials (RCT) or guidelines developed from a systematic review of research from RCT.

Level II Evidence from one RCT or more.

Level III Evidence attained from at least one well-designed controlled trials without randomized assignment.

Level IV Evidence from well-designed case-control and cohort studies.

Level V Evidence from a systematic review of a descriptive and qualitative study.

Level VI Evidence from a single descriptive or qualitative study

Level VII An experts' opinions on the issues and/or a report that the expert committee wrote.

3.6 Appraisal quality and usability of evidence

After finishing the searching process, the evidence was assessed based on the following three questions.

3.6.1 Are the results of the study valid?

Validity of evidence means that all evidence must be conducted in a scientific method and scientifically answer the question of the study. To evaluate research validity, the criteria provided by Center for Evidence-Based Management (CEBMa) (2017) was used to assess a controlled study by using 12 appraisal questions. The checklist for appraisal questions were yes, can't tell and no.

3.6.2 Can the results of the study answer the research questions of this study?

The evidence must be in instruction methods to teach IL skills and their components in the undergraduate nursing curriculum. The primary concern for the results of all evidence was that the research results must be conducted in the scientific method and be an experimental study to gain more IL in nursing students. The results, discussion, data, and other information should be reported professionally and related to whether instruction they provided in their study. All the steps of the research method must be reliable and consistent to ensure that the result of the study was valid and can be used to enhance nursing students' IL ability. Moreover, assessment process for IL skill of nursing students in all evidence must be measured in proper methods.

3.6.3 Is the result of the study can be used as a guideline for IL instruction?

The interventions and the results of that evidence must be applicable, show statistically significant and precise. Also, it should be used generally in the target population. All of the results will consider their generalizable and possibility in a different culture, teaching, and resources.

4. Review results

4.1 Searching result

Based on the searching process from selected databases (using PICO to indicated keywords for searching), the results of evidence related to information literacy instruction in undergraduate nursing students were found in 451 records. After excluded duplicate evidence

and extensive reading, nine pieces of evidence met the criteria. The details of the evidence were shown as follow in Table 1 and figure 1:

Table 1 Summary of included evidence

Databases	Number of items	Number of included evidence
Academic Search Complete	92	1
MEDLINE	74	2
ClinicalKey for Nursing	22	1
ScienceDirect	144	2
Nursing & Allied Health	119	3
Total	**451**	**9**

4.2 Exclusion of empirical evidence

After screening by reading title, abstract, and excluding articles that duplicate in another database, 442 articles were excluded because there was no description of the intervention, a descriptive study without reported of students' IL after intervention, and no improvement after the intervention. Also, the evidence that was not in the undergraduate nursing student field was excluded. Finally, nine articles were left relating to the criteria of this study. Therefore, this study analyzed nine articles to indicate an effective instruction method to improve undergraduate nursing students' IL.

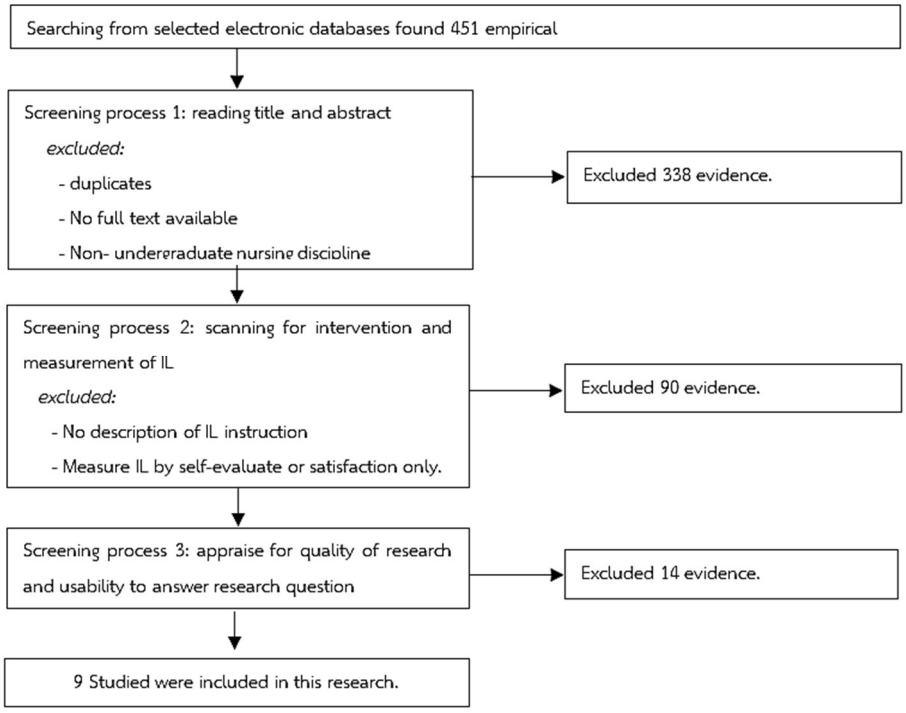

Figure 1 Flow diagram of the evidence searching process.

4.3 Evaluating the quality of empirical evidence

The level of empirical evidence of nine studies was evaluated using the level of strength and reliability of evidence defined by Melnyk & Fineout – Overholt. There are two randomized control trials, five quasi-experimental research, and two cohort study research. All studies can be categorized as shown in table 2

Table 2 Evaluation on level of searched empirical evidence

No.	Author's name / title / journal	Type / level of empirical evidence
1	Brettle, A., & Raynor, M. (2013). Developing information literacy skills in pre-registration nurses: An experimental study of teaching methods. *Nurse Education Today, 33*(2), 103-9.	Randomized Controlled Trial Level II
2	Russell, F., Rawson, C., Freestone, C., Currie, M., & Kelly, B. (2018). Parallel lines: A mixed methods impact analysis of co-curricular digital literacy online modules on student results in first-year nursing. *College & Research Libraries, 79*(7), 948–71.	Quasi-experimental research Level III
3	Lalor, J.G., Clarke, M., & Sheaf, G. (2012) An evaluation of the effectiveness of information literacy training for undergraduate midwives to improve their ability to access evidence for practice. *Nurse Education in Practice, 12*(5), 269-72.	Cohort study research Level IV
4	Rapchak, M.E., Nolfi, D.A., Turk, M.T., Marra, L., & O'Neil, C.K. (2018). Implementing an interprofessional information literacy course: impact on student abilities and attitudes. *Journal of the Medical Library Association, 106*(4), 464-470.	Quasi-experimental research Level III
5	Farrell, A., Goosney, J., & Hutchens, K. (2013). Evaluation of the effectiveness of course integrated library instruction in an undergraduate nursing program. *The Journal of the Canadian Health Libraries Association, 34*(3), 164-175.	Quasi-experimental research Level III
6	Jacobsen, H.E., & Andenaes, R. (2011). Third year nursing students' understanding of how to find and evaluate information from bibliographic databases and Internet sites. *Nurse Education Today, 31*(8), 898-903.	Quasi-experimental research Level III
7	Whalen, K.J., & Zentz, S.E. (2015). Teaching systematic searching in a baccalaureate nursing research course. *Worldviews on Evidence-Based Nursing, 12*(4), 246-48.	Quasi-experimental research Level III

No.	Author's name / title / journal	Type / level of empirical evidence
8	Nordsteien, A., Horntvedt, M.T., & Syse, J. (2017). Use of research in undergraduate nursing students' theses: A mixed methods study. Nurse Education Today, 56, 23-8.	Cohort study research Level IV
9	Shamsaee, M., Shahrbabaki, P.M., Ahmadian, L., Farokhzadian, J., & Fatehi, F. (2021). Assessing the effect of virtual education on information literacy competency for evidence-based practice among the undergraduate nursing students. *BMC Medical Informatics and Decision Making, 21*(1), 1-11.	Randomized Controlled Trial Level II

4.4 Evaluating the use of empirical evidence

All nine pieces of evidence were evaluated for their utility and relevance for this research to discover the effective instruction methods for IL in undergraduate nursing students.

4.4.1 Are the results valid?

All the evidence seems valid because they were conducted in the scientific method and show corresponding research objective, intervention, instruments, and results. All of them were stated clearly in the sample, which included undergraduate nursing students. The outcomes measurement of those studies was appropriate to evaluate students' IL and could be referred to as actual ability instead of perception. The validity of the evidence was analyzed below.

- All the objectives of all study were clear and relevant.
- Students were randomly assigned into the intervention group and control group in 2 randomized control trials. Others were clearly defined of participants' characteristics.
- Most of them mentioned informed consent before participating in research.
- The quality of instruments was mentioned with reliability and validity in some study.
- The measurement of students' ability was a search skills test, a questionnaire with MCQ, short answer, theses, report, and history log files appropriate to represent their actual IL.

- Most of them used proper statistical tests between the two groups, but some were not.
- They reduced bias by using the inter-rater test, random paper, and coding to the blind researcher. A few of them were not reported.
- Drop out, and missing data were reported, such as the sample did not meet the criteria or not participate or not willing to participate in the study.

Even, there was some flaw in that evidence. All selected evidence was considered a promising study. The included evidence showed quality in many ways, such as well-designed research, good intervention, appropriate measurements, and bias reduction.

4.4.2 Can the result of the study answer the research question of this study?

The research question was to know if there is a practical instruction method to promote IL in undergraduate nursing students. The entire nine pieces of evidence focused on the instruction methods to improve IL in undergraduate nursing students. All evidence was conducted in the scientific method, proper design intervention, and reported that students' IL were improved after instruction. Even some research studies did not report inferential statistics to confirm the results of their intervention; they provided qualitative data or course grad to support their findings. This result could be inferred that students IL may improve.

4.4.3 Is the result of the study can be used as a guideline for information literacy instruction?

The one inclusion criteria for selected evidence included in this research must provide instruction methods/tasks or learning activity so that the researcher can appraise its quality and consequence. After intensive reading, all included evidence was provided learning activities/task and instruction methods to guide IL instruction. Even though the instruction methods were run in LMS or their websites, the contents and activities can be applied to other contexts.

5. Conclusion

The results of the study were summarized for teaching IL in undergraduate nursing students as follows.

5.1 Design course expected outcome

IL is a student's competency; there are many frameworks for IL competency that can be used to define students IL ability. Many frameworks such as the Seven pillars, ACRL framework, Big six models, or the most related to the nursing field like Information Literacy Competency Standards for Nurses (ILCSN), as previously mentioned, were proposed worldwide. They can be used as a guideline for the instructor to choose what IL ability should be implemented.

5.2 Present learning tools

After design course outcomes and learning methods, the appropriate learning tools should be created. Assignments, worksheets, or others that let students practice better than only reading. Appropriate learning tools can be guidelines and more significant for a nursing student to improve their IL. This part means that the instructors should provide or at least recommend appropriate learning tools for students.

5.3 Practicing steps by steps

Practice in IL components from easy to hard should be considered in curriculum design. Recommendation for teaching IL with nine steps as below.

First steps begin with library orientation, relevance databases, and basic search menus to help them familiar with the searching steps.

Second, introduce PICO/PIO to nursing students and practice with examples of relevant clinical questions.

Third, practicing with critical appraisal tools to criticize one or two examples of evidence from their previous searching steps.

Fourth, teaching and practicing for truncation, limitations, citations methods, plagiarism, and appropriate referencing methods that they may use in the future, such as APA and Vancouver style.

Fifth, give them the assignment to write a short paper with their interesting clinical topics, use PICO/PIO, try to find appropriate evidence and references.

Six, provided assistant and e-mail to help them with their question and solve their problem.

Seven, use rubrics scoring or paper evaluation criteria to measure their paper.

Eight, give them feedback to help them improve IL.

Nine, teaching them more complexion of searching tools such as MeSH, more truncate and Boolean operators. Finally, provide them with a paper assignment and feedback that may help to measure their IL improvement.

In summary, the IL instruction that previously mentioned can be indicated in the flow diagram, as shown in figure 2.

5.4 Prepare a connection and communication approach

Students mentioned that feedback could help them know their misconception and get better. Then, the instructor should provide a communication method. Assistant, e-mail, or feedback is recommended to help students clear their confusion and learn more complexion of IL ability.

5.5 Select an appropriate evaluation

Students IL is familiar with skills more than others. Appropriate measures should be well selected and in proper use. Students' IL should be measured by their performance, such as perform searching, research paper, and assignment paper more than only self-evaluation.

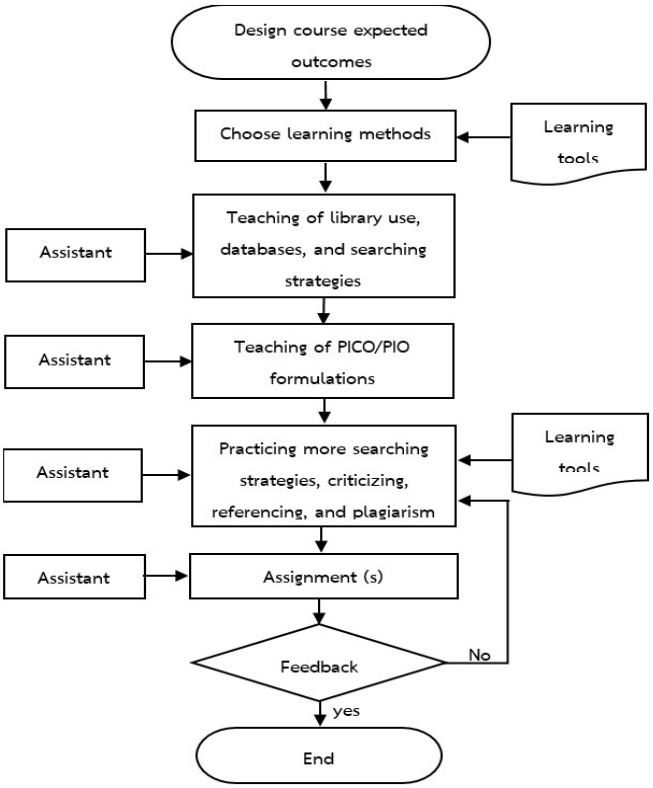

Figure 2 Flow diagram of instruction method.

6. Recommendations

6.1 Implications for nursing education

To equip IL in nursing students, all stakeholders should address their responsibility. Essential stakeholders are the Policymakers, Faculty members, and Nursing students should take their role to supports IL learning. The suggestions for the role of stakeholder as follows:

6.1.1 Policymakers

This study results can be supported evidence for policymaker to choose and plan for information literacy instruction. As previously mentioned, teaching IL, whether face-to-face or online, does not matter as long as they can provide appropriate learning contents and materials.

During the Covid-19 situation worldwide, all organizations have to change their belief, life and learn to be new normal living with pandemic circumstances. Many educational institutes need to deliver more online instruction. This study proved that online IL instruction is practical as well as face-to-face. This result can be evidence support for policymakers to explain to their stakeholders for good effectiveness of online instruction.

6.1.2 Faculty members

Nursing faculty members are the vital persons who set and design IL course. They may take intensive in their capabilities to create and deliver teaching. Moreover, they should possess the ability to design and plan courses.

6.1.3 Nursing students

Nursing students are essential persons to this learning course. They should have lifelong learning skills and self-directed learning skills to practice and learn by themselves. As previously mentioned, the more their practice is, the more IL they gain. Moreover, assignments and learning tasks are the key to successful IL learners; nursing students who want to be skillful in IL should have self-assessment and self-directed learning.

6.2 Implications for research

Many researchers try to design and revise teaching methods to promote their students' IL. This research report can be a basis of future research to explore an instruction method to enhance students' IL in more complex skills such as evaluation and use of new knowledge. More effective learning tools, assignments, and learning tasks should be investigated.

6.3 Implications for nursing practice

In nursing practice situations, a nurse tends to learn and gain more information by themselves. Due to lack of time to practice, provided online learning tools for the nurse professions may help. Online modules available 24 hours and 7 days may be suitable for nurse professions. Whenever the nurse professions needed more evidence to support nursing care, they could select some learning tools or methods for individual practice of IL. For example, searching systematic worksheets can provide guidelines for searching needed evidence anywhere and anytime.

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