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# The effect of problem-solving-based interprofessional learning on critical thinking and satisfaction with learning of nursing and midwifery students

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## Abstract:

**INTRODUCTION:** Problem-solving skills and learner-centered approaches provide students with the ability to solve health challenges by placing them in simulated situations. The aim of this study was to determine the effect of inter-professional learning based on problem-solving on critical thinking (CT) and satisfaction with learning experience in nursing and midwifery students.

**METHODS:** This quazi-experimental study of a single group used pretest–posttest design. 20 undergraduate nursing and 28 midwifery students at the final academic year participated in the study. The research intervention was interprofessional learning based on problem-solving conducted in five 2-h training sessions. California’s CT Scale and 10-point visual analog scale were used to measure CT skills and satisfaction with learning before and after the intervention. Finally, data were analyzed by SPSS software version 23 using descriptive statistics and paired *t*-test.

**RESULTS:** The findings of this study indicated that the mean score of students’ CT before the intervention was poor, while it statistically significant increased after the intervention ( $P < 0.05$ ). It was also found that students’ satisfaction with learning, in the scale of 0–10, was reported from 5 to 9 indicating students had a high level of satisfaction with their learning experience.

**DISCUSSION:** Based on the findings, it can be concluded that the interprofessional education based on problem-solving has been able to significantly enhance the overall critical skills of students, especially in the dimensions of analysis, inference, and deductive reasoning, and also, students’ satisfaction with learning experience was also increased.

## Keywords:

Critical thinking, interprofessional, midwifery, nursing, problem-solving

## Introduction

In the twenty-first century following health, educational, economic, and social challenges, educated healthcare professionals are expected to have high level of problem-solving skills to work in complex clinical situations. Both nurses and midwives must maintain a high level of vigilance and clinical judgment to detect early changes in patient status signaling the need for intervention. This ability requires

critical thinking (CT), problem-solving, and communication skills.<sup>[1,2]</sup> CT was defined as “purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation and inference, as well as an explanation of the evidential and conceptual, methodological, criteriological, or contextual considerations upon which judgment is based”.<sup>[3]</sup> These are important for the development of CT skills, which nurses and midwives require to perform their daily functions in practice.<sup>[2,4]</sup>

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Studies carried out in Iran found that the nursing and midwifery students were low skilled in CT and their Critical Thinking Skills (CTS) did not significantly change during their preregistration program. Thus it may be concluded that the nursing and midwifery education program did not affect the CTS of its students.<sup>[5-7]</sup> On the other hand, the development and measurement of CT skills in undergraduate midwifery students is vital to ensure they are able to apply CT to practice and decision-making. The application of CT in nursing and midwifery practice is complex, and multiple lenses are required to capture its' depth and breadth.<sup>[8-10]</sup>

Moreover, collaboration and highly integrated teamwork among healthcare professionals are essential to patient safety and quality of care.<sup>[10]</sup> Traditional academic learning does not facilitate the interaction of students with other health professionals. During clinical education, students have very little opportunity to interact with other health professionals, which limits professional socialization.<sup>[11]</sup> A learning method based on problem-solving provides the opportunity to enhance interpersonal skills and teamwork and bridges the gap between theory and practice in healthcare area.<sup>[12]</sup>

Interprofessional learning has recently been taken into consideration by medical and nursing faculties. It is broadly defined as a teaching and learning process that fosters collaborative work between two or more healthcare profession.<sup>[10]</sup> And refers to situations where two or more health care providers from different disciplines learn from each other and about each other to improve the quality of care.<sup>[13]</sup> In fact, interprofessional education has been considered as an educational creativity that includes interactive learning between different disciplines that aims at enhancing collaborative performance. This training is one of the innovative methods that encourage students from different disciplines to communicate and interact with each other in a professional team. Such an educational method gives students of different disciplines the opportunity to actively work to solve problems, thus, it prepares them for clinical practice in the future and helps them to achieve good professional communication through respect for each other's roles.<sup>[12]</sup>

Studies conducted in different countries have examined the interprofessional education among different students in clinical settings and showed its positive effects on students' satisfaction with learning experience and their understanding of other professions through their roles by changing their attitude and behavior toward interprofessional collaboration.<sup>[11,14-16]</sup>

There are systematic reviews on the effects of interprofessional education on different outcomes in

medical students. For example, a systematic review by Lapkin *et al.* has also shown that, the majority of studies have been conducted on nursing and medical students, but very few studies have been conducted on the students of other medical disciplines. Findings of this review have demonstrated that, students' attitudes and perceptions of inter-professional collaboration and decision making can be increased through inter-professional training.<sup>[17]</sup> Guraya and Barr in their systematic review and meta-analysis highlighted significant improvements in pre and post-status scores after embedding IPE module in various medical fields as determined by enhanced acquisition of knowledge, skills, and attitudes of learners. However, more research is needed to explore other educational outcomes of students.<sup>[18]</sup> A newer systematic review conducted by Vuurberg *et al.*, reported positive outcomes of teaching preclinical students from medicine and other health care professions. In conclusion, overall IPE seems a promising approach for attitudinal change and to some extent, learning but the clarity about its higher order effects such as CT are still lacking.<sup>[19]</sup>

It seems that, the combined use of inter-professional education and problem-solving learning can help to increase the learning motivation, self-directed learning and satisfaction with learning experience in interdisciplinary subjects,<sup>[12,20,21]</sup> but their effectiveness on CT of nursing and midwifery students is unclear. Hence, this study aimed to investigate the effect of inter-professional learning based on problem-solving on CT and satisfaction with learning of nursing and midwifery students.

## Methods

This was a quazi-experimental study with a pretest-posttest design to investigate the effect of inter-professional learning based on problem-solving on CT and satisfaction with learning of nursing and midwifery students.

Students in the final academic year of nursing ( $n = 20$ ) and midwifery ( $n = 28$ ) from the nursing faculty of the Shahrekord University of Medical Sciences, Shahrekord, Iran, who had enrolled in clinical course were invited to participate in this study.

The study had been approved by the ethical committee of Shahrekord University of Medical Sciences, Shahrekord, Iran (number 10-3-92). Informed and written consent was obtained from all participants prior to commencement. They were informed that it would be free to change to the traditional teaching strategy at any time without effects on their course evaluation.

California CT Scale was used to measure students' CT. This scale has 5 sub-scales of analysis (9 items), evaluation (14 items), inference (11 items), deductive reasoning (16 items) and inductive reasoning (14 items). This scale was previously used by Khalili and Zadeh<sup>[22]</sup> in Iran and its validity and reliability have been confirmed ( $-\alpha = 62\% - 67\%$ ). This scale contains 34 multi-choice items with the scores of 0–34, and each sub-scale scores from 0 to 12. Scores below 11 from the total scale indicates the lack of CT, scores of 11–25 shows moderate CT, and scores of over 25 indicates the strong CT. Score of 4 or less for each subscale is a sign of weak CT and score of 7 or higher illustrates stronger CT skill.

For adaptation process of CCTS we used backward-forward translation technique. All questionnaire items were translated into Persian by two bilingual experts, and then translated back into English by two different translators. Then a panel of two other bilingual experts was invited to evaluate consistency between the English and Persian version of the questionnaire. As a result, 94% consensus was achieved.

To measure satisfaction from the learning experience, the question; "How satisfied are you with your learning experience during this internship?" was asked from the participants using the Visual Analogue Scale with 10 scores (strongly dissatisfied = 0, highly satisfied = 10) as a self-report.<sup>[21]</sup>

The mothers and neonates nursing and the medical-surgical care in pregnancy modules were selected for implementing the study intervention for nursing and midwifery students respectively. Before starting the intervention, students of both disciplines completed the demographic information questionnaire including age, sex, marital status, total grade, and California CT Scale as pretest.

The inter-professional learning module for clinical mother and neonate nursing: Participants included two equal groups of 14 nursing students who enrolled in clinical mother and neonate care and 4 midwifery students volunteered as the tutors and one of the faculty members of the midwifery department as facilitator in each group. During four rounds consisting of 2 h/month, real mothers during labor or neonates needing care after birth were discussed by the students of both disciplines in a classroom context; for example one scenario discussed a new mother who complaining of mass bleeding 2 h after delivery. Nursing students should determine which assessment and intervention were required to solve this problem.

The inter-professional learning module for clinical medical-surgical care: 20 students in the final

academic year of midwifery who were attending the medical-surgical training course accompanied by 3 nursing students as tutors and one of faculty members of medical-surgical nursing department as facilitator participated in rounds of problem solving based Interprofessional Learning (IPL). There were four rounds consisting of 2 h/month. During these rounds, real women with medical problems; surgery during pregnancy or obstetric/gynecologic surgery were discussed between the students of both disciplines in a classroom context. For example, one scenario involved a 29-year-old pregnant women in 28 weeks of gestational age who presented to the emergency prenatal unit with acute abdominal pain. The midwifery students should determine the cause of the event based on their detailed assessment and the appropriate interventions. Students did not know which disease scenario would be discussed in each round.

During both inter-professional modules, tutorial students started the discussion by reading hand-off designed for their respective scenario. Then the students of the two disciplines were required to actively participate to identify problems, prioritize problems, goal setting and appropriate interventions for identified problems. Then, presented ideas were discussed.

After completing IPL sessions, CT and satisfaction with learning experience in both groups were assessed as post-tests.

The data were analyzed using SPSS version 23 (by IBM Corporation, United States), and for the subjects' general characteristics, descriptive statistics such as means, and standard deviations were used. For data analysis we pooled the data from all midwifery and nursing participants as one total group. The Kolmogorov-Smirnov test was conducted to test the normality of the data, and a paired *t*-test was performed to examine the effects of the IPL intervention. All values of  $P < 0.05$  were considered statistically significant.

## Results

Totally, 48 students participated in the study. All samples were females with the mean age of 21. The results of data analysis showed that, the mean score of students' CT before the study was poor ( $10.1 \pm 2.9$ ), while it increased after the intervention ( $12.8 \pm 3.4$ ). The results of paired *t*-test showed that, this increase was statistically significant ( $P < 0.100$ ). The findings of study regarding the CT of students in each of the subdomains of CT are summarized in Table 1. As the table shows, despite the increase in mean scores of CT after intervention, the level of CT of students before and after the intervention in all dimensions was weak, but the results of paired *t*-test

**Table 1: Descriptive indexes and comparing the average critical thinking before and after the intervention using paired t-test**

Dimensions of critical thinking	Statistical indexes				CI	Significant level
	Before the intervention		After the intervention			
	Minimum-maximum	Mean±SD	Minimum-maximum	Mean±SD		
Evaluation	0-5	2.6±1.2	0-7	2.9±1.6	-0.91-0.23	0.3
Analysis	0-3	0.95±1.03	0-4	1.3±1.1	-0.8-0.02	0.03*
Inference	0-3	1.8±0.8	1-5	2.5±1.1	-0.4-1.09	0.001*
Inductive reasoning	0-6	2.5±1.6	0-6	3.04±1.3	-0.07-0.99	0.09
Deductive reasoning	1-4	2.1±0.93	1-5	2.9±1.1	-0.35-1.2	0.001*
Total score	3-16	1.10±2.9	6-18	12.8±3.4	-1.5-3.9	0.001*

\*Significant difference between the groups ( $P < 0.05$ ), CI=Confidence interval, SD=Standard deviation

showed that, in 3 domains of CT including analysis, inference and deductive reasoning, the students' mean CT scores after the intervention were significantly increased ( $P < 0.05$ ). However, in the domains of evaluation and inductive reasoning, the increase was not significant ( $P > 0.05$ ) [Table 1].

In regard to the students' satisfaction with learning experience, the findings of the study showed that, student satisfaction in the scale of 0–10 were at minimum 5 and maximum 9 with a mean of  $1 \pm 7.5$ , meaning that, on average, students had a moderate to high degree of satisfaction from their learning experience. Also, in regard to the relationship between educational program, and CT and satisfaction with learning experience, the Spearman's statistical test showed no significant correlation ( $P > 0.05$ ).

## Discussion

This study examined the effect of inter-professional learning based on problem solving on CT and satisfaction with learning of nursing and midwifery students. The findings of this study showed that, inter-professional learning based on problem-solving led to improve CT of all students in the domains of analysis, reasoning and deduction inference, as well as moderate to high satisfaction of students with learning experience.

The results showed that, students had low CT skills in all domains of CT before the intervention, confirming the findings of other studies conducted in many Iranian universities. For example, studies of Karimi Mounaghi *et al.*, Azizi-Fini *et al.*, Hajrezayi *et al.* and Hemmati Maslak Pak *et al.* on nursing students in Iranian universities showed that, the average CT of the last year students was 10.8 that is similar to the present study.<sup>[5,7,23,24]</sup> Most studies also showed poor CT skills in nursing and midwifery students.<sup>[5-7,25]</sup>

Unlikely, study from America reported CT skills in nursing students at approximately high level.<sup>[1]</sup> In Korea, the average score of student'S CT skill was 56.72 out of 100.<sup>[26]</sup> It seems that, the scores obtained in this study

and other Iranian studies are less than those in foreign countries. This difference in the level of CT scores can be attributed to the differences in the use of effective ways of fostering CT among countries, in a way that, the use of participatory and problem-based learning in countries like the United States has started much earlier than us. Moreover, in Iran, the nursing educational system was performing at the lowest level of cognition; and higher levels of learning such as analysis and evaluation were less considered, and in general, very little attention was given to developing CT According to Kermansaravi *et al.*, there are major and serious barriers to developing CT of students, one of which is the use of traditional teaching methods in the current education system that prevent the development of problem-solving and decision-making skills in learners, which subsequently limit the students' CT opportunities.<sup>[27]</sup>

Kong *et al.* in a meta-analysis study stated that, problem solving education can help nursing students improve their CT.<sup>[28]</sup> The findings of this study showed that, inter-professional learning based on problem solving has been able to significantly increase the overall skill of students' CT, especially in the dimensions of analysis, inference, and deductive reasoning. According to Fazoni *et al.*, inferential skills enable individuals to conclude from evidence. During the problem solving, students need to obtain logical results from their prior knowledge to offer appropriate diagnosis and intervention.<sup>[29]</sup>

Although, studies that examine the impact of inter-professional learning based on problem solving on CT and satisfaction of students from learning experience in quantitative terms was not found, the results of qualitative studies on the experience of health-related students from participating in inter-professional or problem-solving programs have had similar results. For example, the development of CT and high satisfaction from learning experience using problem solving have been demonstrated in many studies from both developing and developed countries, including the studies of Al-Kloub *et al.* in Egypt, Yuan *et al.* in China,



Murphy *et al.* in Ireland, Chan, Niemer *et al.*, Walshe *et al.* as well as studies of Frambach *et al.* and Reeves *et al.*<sup>[29-36]</sup>

The important point is that, although inter-professional learning based on problem solving has managed to improve the overall ability of students to apply CT, the level of CT of students before and after the intervention in all dimensions was weak. This can be attributed to the short-term inter-professional training in a few limited sessions. Therefore, it is necessary to use this method of learning at the early stage of education, and its long-term effects should be investigated.

This study is novel as it examined midwifery and nursing students' satisfaction and CT following participation in an inter-professional education but it had some limitations. First, the overcrowded schedule of the participants and the availability of the faculty placed restrictions on this study. Moreover, limitations included a small sample size of nursing and midwifery students. Recommendations from this study are to examine inter-professional learning with a larger sample size and for the first semester of clinical course to provide students the opportunity for evaluating their CT in real clinical practice.

## Conclusion

In today's complex health care environments, nurses and midwives should have CT skills to make appropriate clinical judgments and decisions. The results of this study somewhat confirmed the use of inter-professional learning based on problem solving method as one of the methods for improving the CT of nursing and midwifery students. However, implementing 4 inter-professional training sessions only identified the short-term effect of this method. Studies with more training sessions and long-term evaluation are recommended to determine the long-term effects of this method.

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## Conflicts of interest

There are no conflicts of interest.

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