

# The Effect of Implementing the Competency-Based Education Model on the Clinical Skills Among Midwifery Students

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## Abstract

**Background:** From the past to the present, the traditional lecturing method has been the usual and preferred method for teaching, and instructors use learner-oriented methods such as group discussion less due to reasons such as being time-consuming and low-experienced in both groups of learners and professors in this regard.

**Objectives:** The present study was conducted to compare the effect of implementing the competency-based education model on the clinical skills among midwifery students.

**Methods:** This study was semi-experimental; the samples consisted of 34 midwifery students randomly assigned to two experimental and control groups. The procedures of pelvic examination, Leopold maneuvers, and suturing were taught in the form of competency-based education during six 60-minute sessions for the experimental group, and the control group was trained according to the conventional method. The required information was collected by the triple skills checklist, and finally, the data were analyzed using descriptive statistics and analysis of covariance (ANCOVA) test in SPSS software.

**Results:** After the intervention, in the experimental and control groups, the pelvic examination skill scores were  $38.00 \pm 8.41$  and  $20.76 \pm 7.91$ , the Leopold maneuvers scores were  $35.40 \pm 6.29$  and  $23.18 \pm 6.73$ , and the suturing scores were reported as  $30.71 \pm 6.93$  and  $22.12 \pm 9.58$ , respectively ( $P < 0.050$ ). The results of the ANCOVA test showed that competency-based education affected learning the pelvic examination skill with an effect size of 0.893, suturing with an effect size of 0.644, and Leopold maneuvers with an effect size of 0.860.

**Conclusion:** Given that students' skill needs are considered in detail in the competency-based model and are accompanied by continuous evaluation and feedback, they can affect clinical learning. Based on the obtained results, it is suggested that instructors and professors use the competency-based education method as a strategy in addition to the conventional method for teaching professional skills in midwifery.

**Keywords:** Competency-Based Education; Clinical Skills; Midwifery

## Background

Midwifery education is a part of the health system that deals with human life, and paying attention to its quantitative and qualitative aspects is of particular importance. The largest amount of education is provided in clinical form in hospitals, and during education, students learn various skills to play their professional roles in the future. Therefore, the effectiveness of education can significantly impact professional skill learning. The results of some studies have shown that achieving maximum efficiency, production, and productivity depends on the evolution of the professional role, and despite having a strong

theoretical base, graduates in the fields of nursing and midwifery do not have sufficient expertise, skill, and efficiency in clinical environments and are weak in the problem-solving process (1).

Experts believe that in order to enter a professional position and provide the highest amount of productivity and efficiency, students in some fields, such as midwifery and nursing, need appropriate theoretical and practical education (2). In this regard, teaching effectiveness is one of the most important concerns of those in charge of education. Effectiveness refers to investigating the effectiveness of the actions taken (education) to achieve predetermined goals (skill) (3). It seems that education with conventional approaches

does not have the necessary durability, and the need to use new teaching methods in educating clinical skills in midwifery is felt (4). Midwifery graduates have mentioned the lack of coordination of educational planning as an inhibiting factor in learning (5), while despite the existence of problems in clinical education and the need to review the method of clinical internships due to the complexity of education in the clinical environment, only a few research on teaching and learning has been conducted in this environment and on how to improve it (6).

Having sufficient knowledge and skill is one of the necessities of a midwife. In this regard, the first strategic guideline for strengthening midwifery services was provided by the World Health Organization (WHO) in 2002-2003 and continues until 2030. One of these strategies is competency-based education in the stages before starting the service (7). Competency is defined as the acquisition of a set of knowledge, characteristics, attitudes, and skills related to each other that has a great impact on individuals' jobs, is correlated with individuals' performance at work, can be evaluated with acceptable standards, and can be improved through education and development (8). The competency-based education approach is an active and learner-oriented method (9) in such a way that the final performance is obtained according to the goals of each academic course, structural items, and evaluations (10). The main emphasis of this approach is on defined achievements and the needs of society and the labor market (11). In most competency-based definitions, the concept of competency includes the three dimensions of "knowledge, attitude, and skill" (12). In fact, this type of education emphasizes both how to learn and the achieved performance (13).

In the competency-based education model, at the beginning of each course, a list of learning goals, content, and desired competencies that students are expected to achieve at the end of the course and the knowledge required to achieve these competencies are provided to and approved by the students. This method can lead to identifying capabilities and help students make decisions during the clinical course. In this model, results and consequences are emphasized more than knowledge acquisition (14).

The effectiveness of the competency-based education approach on the clinical skills has been investigated and verified in a range of job positions; of course, most of the evaluated statistical samples have been among the nursing community. The results of Soheili et al.'s research, which was conducted among the 8th-semester nursing students

of the Urmia Faculty of Nursing and Midwifery, showed that the clinical performance of the students in the experimental group who had spent their course based on the competency-based education model, both in terms of specific and general clinical performance, was significantly better than those in the control group (15). Also, numerous other studies have been conducted on clinical nursing skills inside and outside the country (16, 14). Nevertheless, not much research has been reported about the effectiveness of the competency-based education model on the clinical skills of midwifery students. Although many studies have been conducted on the effect of different teaching methods, the question is still raised: "Among the teaching methods, which one is more effective in the clinical education of students?" (14).

Midwifery students receive a lot of training and need a variety of clinical skills. Some of these skills are pelvic examinations, Leopold maneuvers, and suturing. Performing pelvic examinations during childbearing will lead to detecting the lack of progress and possible dystocia, which can cause irreparable consequences for the mother and the baby. Also, Leopold maneuvers help estimate the fetus's weight, prevent dystocia or restriction of fetal growth, and detect the fetus's placement and presentation, which a mistake in the diagnosis of each one will have serious consequences. Failure to perform an on-time episiotomy with indication and the correct way to repair it will cause urinary and fecal incontinence, fistula, and dyspareunia in the future (17). Considering the sensitivity of the midwifery profession, the need for high accuracy and promptitude, the power of decision-making, and observing the importance of the subject, and also numerous weaknesses in this field and on the other hand, the lack of comprehensive research on the clinical skills, the present study examined the effect of the competency-based education model on the clinical skills among midwifery students.

### Objectives

The present study was conducted to compare the effect of implementing the competency-based education model on the clinical skills among midwifery students.

### Methods

This study was conducted in a semi-experimental way with pretest-posttest stages in two experimental and control groups in 2020. The research samples included all the 5th- and 7th-semester midwifery students of Razi Faculty of Nursing and Midwifery, Kerman University of Medical Sciences (n = 34).

Inclusion criteria included passing theoretical pregnancy and childbirth courses as a prerequisite and participating in all educational sessions in both groups. Refusal to continue participation in the research during the educational sessions and not attending the educational sessions for the experimental group were also considered exclusion criteria.

After obtaining informed consent, the participants were placed in the control and experimental groups based on random allocation in the form of a lottery and the code they received. Before the intervention, both groups were evaluated in terms of procedural skills in such a way that the students' practical skills were observed by an evaluator, and the checklist was completed for each student. The evaluator was a specialist in the field of midwifery, for whom blinding was done, and the evaluator did not know which individuals were in the control group and which were in the experimental group and only completed the checklists based on the code assigned to the individuals.

The data collection tool was the checklist of triple procedural skills. This checklist included a personal information form (age and diploma grade point average [GPA]) and a procedural skill checklist (vaginal examination skill with 16 items, Leopold maneuver skill with 17 items, and suturing skill with 13 items). For each item in the skill assessment forms, there was a Likert scale (with a scoring rate based on performing the skill perfectly (score 4), well (score 3), averagely (score 2), poorly (score 1), and not performing the skill or performing it wrongly (score 0). The maximum scores for the vaginal examination checklist, Leopold maneuvers, and suturing skills were considered 64, 68, and 52, respectively. This tool was designed in a study by Hatamirad et al., its content validity and reliability were calculated using the inter-observer agreement method, and its value was confirmed at 0.85 (18). In the present study, the values of content validity ratio (CVR) and content validity index (CVI) with the opinions of 10 experts in this field for all questions were higher than 0.63 for CVR and 0.79 for CVI. Also, to check the research tool's reliability, Cronbach's alpha coefficient was used, and this value was reported as 0.97, 0.97, and 0.98 for pelvic examination, Leopold maneuvers, and suturing, respectively.

In order to prevent data contamination, the control group was first evaluated, and then the intervention was performed for the experimental group. A group instructor for the control group and an instructor proficient in competency-based education were used. A third instructor was also used as an evaluator for whom blinding was done in the study. As usual, the control

group received its usual educational program, and the experimental group also received competency-based education. The education time of the experimental group was six 60-minute sessions. Two months later, individuals in both groups were examined again in terms of procedural skills.

The model design was based on the general competency-based education model in three stages: "Needs assessment and designing, education implementation, and evaluation." The education implementation stage was performed during the educational intervention. In the educational intervention stage for the experimental group, the instructor proceeded to educate the midwifery students in interaction with the research team within the framework of the course objectives listed (Table 1). The instructor of the experimental group adhered to the principles of the competency-based education model and was thoroughly familiar with the education method and goal. In the current study, competency-based education was implemented in four stages, which are described below.

The first step: Defining the tasks and activities that midwifery students are expected to achieve;

The second step: Standardizing competencies to clarify the roles and responsibilities of midwifery students;

The third step: Implementing the educational program and following it;

The fourth step: Evaluation.

The first step: The tasks and skills expected from the students were determined based on the approved educational program and the opinion of the professors and students of the course.

The second step: Standardizing competencies: Clarification of roles and responsibilities and planning for students' education were performed. The duties of the instructor and the students were specified, and based on the students' level, it was determined how many educational sessions were required. Educational goals (in the fields of knowledge, attitude, and performance) were also formulated.

The third step was implementing the educational program carried out in the present study for the students in the experimental group.

The fourth step: The evaluation in this stage was different from the final evaluation that was performed by the evaluator instructor and during the education process was performed by the instructor with quick feedback to the students.

Data were analyzed using descriptive statistics (mean, frequency) and research hypotheses using paired t-test and covariance, and assessment of the statistical

prerequisites of normality of data distribution, homogeneity of regression slope, and homogeneity of variance in SPSS software version 22 (version 22, IBM Corporation, Armonk, NY).

### Results

The results related to the descriptive statistics of the distribution of students' age and GPA showed that the two groups were similar (Table 2).

In all the examined skills, the performance scores of the two groups in the pretest stage had no significant difference, and the groups were homogeneous in this respect in the pretest stage (Table 3).

The descriptive statistics related to the scores of the experimental and control groups in the pretest and posttest stages are presented in Table 4. Based on the results, the scores of the three skills in the experimental group increased following the competency-based education method ( $P < 0.001$ ). Also, the difference in the mean scores of suturing and Leopold skills was observed in the posttest stage in the control group compared to the pretest stage, meaning that conventional education was effective in the mentioned procedures ( $P < 0.001$ ).

The results showed that the students who were educated by the competency-based method had higher levels of pelvic examination, suturing, and Leopold examination skills than those who were educated by the conventional method, with an effect size of 0.893, 0.644, and 0.860, respectively (Table 5).

**Table 1.** The implementation steps of competency-based education

Education Type	Defining Tasks and Activities	Standardizing Competencies	Implementing the Educational Program	Evaluation
Pelvic examination	<p>Pelvic examination is a way for midwives to look for disease symptoms in specific organs of a woman’s body. This examination is used to check things such as the vulva (external genitals), uterus (womb), cervix (opening from the vagina to the uterus), fallopian tubes (tubes that carry the ovum to the uterus), ovaries (organs that produce ovum), the bladder (the bag that holds urine), and rectum (the sheath that connects the large intestine to the anus).                      When are pelvic interventions performed?                      Pelvic examinations are performed during an annual physical examination, when a woman is pregnant, when a doctor or midwife is investigating an infection (such as chlamydia, vaginosis, trichomoniasis, and others), or when a woman has pelvic or back pain, which the clinical skill in this education aims to pelvic examination for when a woman is pregnant.</p>	<p>Before the examination, the midwife will ask the person to undress, put on the disposable examination gown, sit on the examination table, and then the midwife will ask about any health concerns.                      Then the person will lie on her back and place her feet on the footstool. The midwife asks her to calm down, puts pressure on the person's lower stomach, and performs an organ examination. Then the doctor or midwife asks the person to move to the end of the table and bend her knees.                      First, the doctor or midwife examines the parturient for signs of infection, swelling, and wounds. In the next step, the midwife inserts a speculum into the vagina, making it wider, and observes the internal organs more easily.                      Then they may do a Pap smear test. This test involves a sample of cells from the cervix to check for abnormalities, especially cervical cancer. The midwife may also use a sample of vaginal discharge to check for infection.                      Then, with a speculum, the midwife performs a two-handed examination, which includes placing two fingers inside the vagina and pressing the pelvis with the other hand, aiming to investigate changes or abnormalities in the reproductive organs. The doctor or midwife can then perform a rectal examination by inserting a gloved finger into the rectum to check for tumors and other abnormalities behind the wall of the vagina, uterus, and rectum.</p>	<p>Educational intervention in the experimental group</p>	<p>Checklist by the evaluator officer</p>
Leopold maneuvers	<p>Leopold maneuvers are used with an empty bladder to check things such as checking the number of fetal placentas, showing fetal placement and position, estimating fetal weight and uterine height, checking fetal head flexion and extension, and checking engagement.</p>	<p>The first maneuver (Fundal)                      Place the fingers of both hands on the fundus of the uterus.                      Touch the fetal progenitor (head or bottom of the fetus) at the fundus of the uterus.                      A large and nodular body is felt when touching the bottom of the fetus.                      A round body is felt when touching the head, which is more mobile and flexible.                      The second maneuver (Lateral)                      Place your palms on both sides of the mother’s abdomen.                      Squeeze the abdomen gently but deeply.                      On one side, a hard and resistant structure, i.e., the back of the fetus, is felt; on the other side, some numerous, irregular, and moving parts are touched, which are the fetus's organs.                      By determining which side the back of the fetus is on, you can find the place where you can hear the sound of the fetus's heart.                      The third maneuver (Pawlik)                      Using the thumb and other fingers of one hand, the mother’s lower abdomen, just above the symphysis pubis, is firmly grasped between the fingers.                      If the presentation organ is not engaged, a mobile mass, often the fetal head, is touched. The way to distinguish the head and bottom (breech) is the same as the first maneuver. However, if the fetal presentation organ is deeply engaged, the results of this maneuver will only show the place of the fetal lower pole in the pelvis, and the examination details will be determined in the fourth maneuver.</p>	<p>Educational intervention in the experimental group</p>	<p>Checklist by the evaluator officer</p>

		<p>The fourth maneuver (Pelvic)</p> <p>To perform this part of the examination, the face of the doctor or midwife must be toward the patient's legs.</p> <p>With the tips of the first three fingers of both hands, the examiner puts deep pressure in the direction of the axis of the pelvic inlet.</p> <p>If, during movement, one of the hands hits a bump, it stops, and if the bump is on the back side of the fetus, the head has an extension, and if the bump is in the direction of the limbs, the head of the fetus has a flexion, and it is when the head of the fetus has descended into the pelvis.</p>		
Suturing	<p>It is necessary for students in this part to get familiar with the types and methods of stitching, its reasons and importance, its tools, and the correct method. In this regard, in this part, the students of the experimental group are taught the suturing types, tools, correct way of doing, reasons, and importance.</p>	<p>The following three methods are used to close the stitches on the abdomen:</p> <p><b>Stapler:</b> The midwife uses a skin stapler to close the incision with metal staples. This option has many usages and is a simple and fast method.</p> <p><b>Suture:</b> In this method, the incision on your abdomen is sewn using thread and a needle. This method takes a long time and may take up to 30 minutes. According to some midwives, this method is better. A study in 2014 demonstrated that women who had used sutures had experienced fewer complications than those who used a stapler.</p> <p><b>Glue:</b> Surgical glue closes the incision made on the abdomen and is filled with a transparent solution. According to some experts, the glue heals faster and leaves the least scar on the skin, but this method is not always a good option. In order to use this method, the midwife has to check several factors, including the method of cesarean delivery, creating a horizontal incision, and the harmony of the skin and abdominal fat.</p> <p><b>Absorbable cesarean suture:</b> It is one of the types of sutures used for wound healing. In the following, we will explain more about this type of suture. In order to perform a cesarean delivery, two incisions are made on the mother's abdomen: The first incision is in the lower abdomen, about one or two inches above the pubic hair; the second incision is made in the uterus through which the baby is removed. The incisions made on the abdomen may not be the same as those on the uterus.</p> <p>Each of the incisions is in one of the following two ways:</p> <p><b>Horizontal:</b> Transverse incision is used in most cesarean sections. The reason for using this type of incision is that it is performed in the lowest part of the uterus, which is also thinner, and less bleeding is created after the operation. Also, it has the advantage that if the delivery is vaginal, the amount of separation will be small in the next pregnancy.</p> <p><b>Vertical:</b> The use of this method is known as the classic cesarean section. The incision made in this method starts from the bottom of the middle part of the abdomen and continues to the pubic line. This method was commonly used in the past, but today it is used more for special cases, for example, in situations where there is a wound in a previous surgery, if the fetus is in an unusual position, or when an emergency delivery must be performed. Vertical incisions are more painful and take longer to heal.</p> <p><b>Examination of the birth canal:</b> The genital-urinary system should be examined for the presence of rupture. Grading of episiotomy should be determined based on the following grades:</p>	Educational intervention in the experimental group	Checklist by the evaluator officer

		<p>First degree: Damage to the epithelium of the vagina, rupture of the fourchette, and rupture of perineal skin.</p> <p>Second degree: Rupture of fourchette and perineal skin, vaginal mucosa, bulbospongiosus muscles, and transverse-superficial perineum.</p> <p>Third degree: Rupture of fourchette, perineal skin, vaginal mucosa, perineal muscle, and anal sphincter.</p> <p>Fourth degree: Rupture of the perineum, anal sphincter, and anorectal mucosa.</p> <p>After the removal of the placenta and before the repair of the episiotomy, if there is a rupture, the ruptures that bleed or lead to changing the anatomical shape are repaired first.</p> <p>Episiotomy head and bleeding areas should be checked, and if there is a bleeding vessel, the vessel head should be blocked, similar to an 8. In order to have a better view and absorb blood, before doing this, a tampon should be placed in the vagina, and then with the help of a forceps, its continuation should be connected to the mother's abdomen. U methods and the cross method should be taught in restoration.</p>		
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**Table 2.** Descriptive statistics and homogeneity test of the experimental and control groups based on age and academic GPA

	Group	Mean ± Standard Deviation	Statistics t	P-Value
Grade Point Average	Experimental	16.64 ± 1.05	1.65	0.254
	Control	16.11 ± 1.60		
Age	Experimental	21.29 ± 0.92	-1.650	0.109
	Control	21.82 ± 0.95		

**Table 3.** The performance scores observed in the two groups for the procedures examined in the pretest stage

Procedure	Group	Mean ± Standard Deviation	Statistics t	P-Value
Pelvic examination	Experimental	15.41 ± 10.10	0.034	0.973
	Control	15.53 ± 10.24		
Suturing	Experimental	7.71 ± 6.68	0	> 0.999
	Control	7.71 ± 7.15		
Leopold maneuvers	Experimental	13.41 ± 9.04	0.139	0.890
	Control	13.82 ± 8.19		



**Table 4.** Descriptive statistics and test results of the assumption of difference in mean scores in the pretest and posttest stages of the experimental and control groups

Procedure	Experimental Group	Mean ± Standard Deviation	Result of the Mean Difference Hypothesis Test	
			Statistics t	P-Value
Pelvic examination	Pretest	15.41 ± 10.10	-7.083	0.001
	Posttest	38.00 ± 8.42		
Suturing	Pretest	7.71 ± 6.68	-9.720	0.001
	Posttest	30.71 ± 6.93		
Leopold maneuvers	Pretest	13.41 ± 9.04	-10.083	0.001
	Posttest	40.35 ± 6.29		
<b>Control Group</b>				
Pelvic examination	pretest	15.53±10.23	-1.669	0.106
	posttest	20.76±7.910		
Suturing	pretest	7.71±7.15	-4.970	0.001
	posttest	22.12±9.59		
Leopold maneuvers	pretest	13.82±8.19	-3.635	0.001
	Posttest	23.18±6.74		

### Discussion

The effectiveness of education can greatly impact the professional skill learning of students in the field of medical education. The results of the present study showed that both traditional and competency-based education affected the skill acquisition of midwifery students. The experimental group had higher scores in all three investigated procedures (Leopold maneuvers, pelvic examination, and suturing) than in the pretest stage, while the control group scored higher in Leopold maneuvers and suturing. It seems that since competency-based education is more consistent with the goals, structure, and evaluations, and on the other hand, it is based on completely clear and need-based achievements and also includes the three dimensions of knowledge, attitude, and skill (18, 19), the obtained results are not far from expectations.

Based on the results of the present study, the difference in improving the scores of suturing, pelvic examination, and Leopold maneuver skills was significantly higher in the experimental group than in the control group. Although previous studies have

clearly less evaluated the effectiveness of this method on professional skills in a specific way, it can be said that the results of the present study are consistent with the findings of Hakimi et al.'s study that competency-based education affects the levels of awareness, skill, and self-confidence of midwifery students (3). Hosseini et al. also compared competency-based education and lecturing methods in their research and concluded that there was a significant difference between the mean score of knowledge and performance in the two groups before and after the intervention, and the comparison between the two groups showed that regarding performance, the competency-based group obtained a higher score (19), which was similar to the results of the present study.

By conducting a study, Soheili et al. found that the clinical performance of the experimental group students who had completed their course based on the competency-based education model was significantly better than the control group students, both in terms of special and general clinical performance (15), which was consistent with the findings of the present research. In a study, Naderi et al. investigated the effect of two competency-based and traditional education methods on the active learning of cognitive and clinical skills of nursing students in the 7th semester of internship in the intensive care unit (ICU) of one of the hospitals of Urmia University of Medical Sciences.

**Table 5.** The covariance test of the effectiveness of education through the competency-based model on improving pelvic examination, suturing, and Leopold maneuvers skills

	Source of Changes	Statistics F	P-Value	Effect Size	Test Power
Pelvic examination	Pretest	185.512	< 0.001	0.857	1.000
	Groups	258.649	< 0.001	0.893	1.000
Suturing	Pretest	168.933	< 0.001	0.845	1.000
	Groups	55.976	< 0.001	0.644	1.000
Leopold maneuvers	Pretest	69.179	< 0.001	0.691	1.000
	Groups	190.162	< 0.001	0.860	1.000



They concluded that the application of the competency-based education method provided the necessary opportunity to promote and improve learning the clinical and cognitive skills of nursing students more than the conventional method (14) and in this sense, it can be said that this finding is similar to the results of the present study.

Woeber concluded in a study that the competency-based education method contributed to the students' clinical skill learning by highlighting learning goals for clinical skill learners, showing the content plan in the curriculum, as well as strengths and gaps in clinical education for all programs (20). Also, Imanipour et al. reported in their research that competency-based education could increase the clinical performance of healthcare service providers (21). Given that the competency-based education model in all educational departments and components has considered midwifery students in the form of predicting the education and skill needs and also is accompanied by feedback from the instructor and continuous evaluation, it can affect learning and the quality of clinical learning more than other educational models.

### Conclusion

Based on the results obtained from the present research, using the competency-based model in addition to the conventional and traditional methods is suggested due to the emphasis on all three learning areas of knowledge, attitude, and performance; on the other hand, continuous evaluations should be used to ensure the skill acquisition as a suitable educational method to promote the quality level of midwifery clinical education. Diversity in the use of educational methods can both improve the quality of teaching and help increase the students' motivation and also significantly affect the students' profession-learning and professionalization. Since some professors may not know how to implement this method and do not have the experience of using it, it is suggested that the training of professors be provided in the form of practical workshops during empowerment courses.

**Supplementary material(s):** is available here [To read supplementary materials, please refer to the journal website and open [PDF/HTML](#)].

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