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The critical thinking skills of nursing students in Kazakhstan

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Abstract

Background: Kazakhstan is undergoing reform in the field of nursing to reach an international level. This requires training of competent nurses. Critical thinking is one of the main components of nurse's competency development, and it is necessary not only in clinical practice, but also in the preparation of nurses at various educational levels.
Aims: The purpose of this study was to investigate the critical thinking of applied undergraduate and traditional nursing students at the graduate level of education, and to give recommendations to teachers of medical colleges in Kazakhstan based on the results.
Methods: Research was conducted using quantitative method. The design was observational, descriptive, and cross-sectional. Participants were 218 graduates of applied bachelors in nursing and 231 future graduate nurses of technical and professional education. The Nursing Critical Thinking in Clinical Practice Questionnaire was used to measure the level of critical thinking. The socio-demographic factors were examined using descriptive statistics, and to determine the statistical differences between the two groups, Chi-square test and the U-Mann-Whitney tests were used.
Results: Results showed that the critical thinking of graduates of applied bachelors in nursing was middle level (345), and the critical thinking of future graduate nurses of technical and professional education was low (309). All the items in the questionnaire, except for seven, showed a significant difference ($p<0.01$) between the two groups. Graduate nurses of applied bachelors showed a high indicator for the average value for the intellectual and cognitive (154.1) and technical (21.2) dimension. Future graduate nurses of technical and professional education showed a high indicator for the average value for the intellectual and cognitive (139.6) and interpersonal and self-management (62.7) dimensions.
In conclusion, the results obtained showed that the level of critical thinking of applied bachelor graduates in nursing is higher than that of future graduate nurses of technical and professional education. In addition, the results showed the need to improve the critical thinking of nursing students in technical and professional education, and nurses of applied bachelor's degree should consolidate critical thinking.

Keywords:
critical thinking, nursing, nursing students, nursing education

Miscellaneous (Confidential information)

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1 Introduction

Rapidly changing trends and different areas of health care require professional nurses to develop critical thinking (Yuan, Williams, & Fan 2008). Caring for patients with various diseases is one of the complex processes, and critical thinking is one of the solutions to such complex processes, so there is a need for the development of critical thinking in nursing education and care. In addition, critical thinking is critical not only in nursing, but in all areas of medicine. (Yurdanur 2016.) Nurses must be effective in coping with complex changes, increased demands and greater accountability; they must have higher-level thinking and reasoning skills. (Kieft, Brouwer, Francke, & Delnoij 2014.)

The ever-changing nature of the medical field, along with the need to care for the patient in tandem with an evidence-based approach, requires a high degree of competence, which is of great importance in education and professional practice. A number of international organizations have taken a position to place greater emphasis on critical thinking. Critical thinking is one of the main elements in nursing practice. The use of critical thinking in clinical practice contributes to the development of competencies and professional activities of nurses. However, critical thinking improves the quality of patient care by nurses. The scoping review by Zuriguel Pérez, Lluch Canut, Falcó Pequeroles, Puig Llobet, Moreno Arroyo, and Roldán Merino (2014) noted that there was insufficient research in the field of critical thinking in nursing practice. (Zuriguel Pérez, Lluch Canut, Falcó Pegueroles, Puig Llobet, Moreno Arroyo, & Roldán Merino 2014.)

Critical thinking is a basic skill, but it is difficult to acquire or measure in nursing practice even though critical thinking skills are an important part of nursing. Correct decision-making in the patient's situation, organization of care, and the positive results of patient care largely depend on the critical thinking of the nurse. In many countries, employers require medical graduates to be able to think critically. Many tools are being developed to determine the level of critical thinking, and these tools provide opportunities for educators and clinical employers to get a nurse to reach a certain level of critical thinking. In addition, these tools will help determine the level

of critical thinking skills that the graduates have achieved when they take over. (Jacob, Duffield, & Jacob 2018.)

Students of higher professional colleges should be well prepared for further self-development, strive for different ways to achieve goals, independence and independent decision-making, and have a sense of responsibility. One of the main tasks of colleges at the present stage is to obtain not only knowledge and skills but also the disclosure of the abilities of each student, who will always be ready for life in a high-tech, competitive world. (Miftakhov & Gilyazetdinov 2018.)

In Kazakhstan, there are transformations and reforms in all spheres, including in nursing. The goal of the nursing reform is to raise the level of nurses to the international level. For this purpose, changes in the educational process of nurses in higher medical colleges are implemented to train highly competitive, competent nurses in Kazakhstan. To do this, nursing students need to be taught professional thinking, flexibility of thinking, awareness, patience, tolerance, deep analysis of the information received, and the selection of true and false. (Comprehensive plan for the development of nursing in the Republic of Kazakhstan until 2020, 2014)

In this regard, there is a need for the formation of critical thinking of nursing students. The purpose of this thesis is to determine the level of critical thinking of nursing students at the undergraduate level and in traditional education, and to give recommendations to teachers of medical colleges for the development of critical thinking of nursing students.

2 The importance of critical thinking in nursing

Nurses work in a complex, intensively changing situation. The healthcare system is described by continuous technological growth, changes, and new knowledge and treatment techniques emerging constantly. Critical thinking skills are essential to enable nurses to function as needed in this environment, to hold on to and develop in a profession whose field of expertise is never stagnant, and the number of professional staff is never sufficient. (Jones & Morris, 2007).

Critical thinking is defined as “purposeful, self-regulatory judgement; an interactive, reflective, reasoning process of making a judgement about what to believe or do"

(Facione & Facione 1996, according to Khosravani, Manoochehri, & Memarian 2004). According to Yildirim and Özkahraman (2011), Yahiro and Saylor (1994) have defined critical thinking in care as follows: "the critical thinking process is reflective and reasonable thinking about nursing problems without a single solution and is focused on deciding what to believe and do". Critical thinking is “the intellectually disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing, and/or evaluating information". (Scriven & Paul 2016). Some scientists have suggested that critical thinking is "the art of thinking about your thinking while you are thinking in order to make your thinking better: clearer, more accurate and more defensible". (Paul & Elder 2013, 376.)

The authors of different articles (Khosravani, Manoochehri, & Memarian 2004, Yildirim, & Özkahraman 2011, Scriven, & Paul 2016, Paul, & Elder 2013) have given many definitions of critical thinking. But, in general, their meanings are almost the same: critical thinking is one of the types of intellectual activities of a person, which is characterized by a high level of perception, understanding, and objectivity of approach to his environment. It is important to use and develop critical thinking skills since such skills increase the likelihood of obtaining the desired result.

It turns out that nursing students rarely face difficulties in mastering clinical practice skills but may face problems with reaching proficiency in critical thinking and academic writing skills. Therefore, most educators around the world pay more attention to the problems of critical thinking in higher education and the ability to effectively apply critical thinking in the performance of work. (Borglin, & Fagerström 2012.)

According to Drennan (2010), critical thinking is one of the main results that students must achieve after completing a master’s education program. The nursing training program considers critical thinking as a central outcome for graduates. Despite the key place of critical thinking in patient care training programs, there is no specific way to see if this result is actually achieved. (Drennan 2010.)

Critical thinking is needed not only in clinical practice but also in the training of nurses at different levels of education. It helps nurses in the future to develop their ability to think critically. So today, different ways and methods are considered to

develop critical thinking in learning. The most important task for researchers is to develop tools to assess critical thinking in the field of nursing. (Simpson & Courtney 2002.)

All students who move on to the final year will need to develop critical thinking to provide quality care in a challenging healthcare environment. While developing critical thinking skills, students also learn the ability to think logically. Learning critical thinking skills may seem like a time-consuming process at first, but once learned, it can be quickly applied to one's profession. Thus, students develop their ability to be flexible in difficult situations. (Whiffin & Hasselder 2013.)

Nurses can diagnose, evaluate, and intervene in clinical situations by making appropriate decisions. Critical thinking is a crucial skill in the diagnosis process on the part of nurses (Bittencourt & Crossetti 2012). It certainly influences the nurses' further actions, such as analysis, evaluation, and conclusion. (Facione, Facione & Giancarlo 2000, according to Bittencourt & Crosetti 2012). This means that nurses should strive to improve critical thinking to ensure a greater degree of accuracy in nursing diagnoses. (Garcia, Nóbrega, Carvalho 2004, according to Bittencourt & Crossetti 2012.)

Starting from the first year, a novice student nurse intervenes in the nursing process. Then the first course begins with the development of critical thinking. As the course progresses, the critical thinking skills of nursing students develop. If nurses do not have critical thinking skills at the end of their final year, this can pose a serious problem for employers. Every day the health sector is becoming more difficult, so you need competent nurses who have the skills of logical thinking. (Tyne 2018.)

Critical thinking is more than going over a checklist, and it is very important to study all the factors that improve critical thinking skills. Clinical practice has a positive effect on critical thinking. Clinical conditions should be comfortable for both the nurse and the patient. Thus, the practice must be effective and productive for both the nursing workers and students. (Arli, Bakan, Ozturk, Esirik, & Yildirim 2017.)

For the development of critical thinking among students, teachers can create their own method or add various teaching methods for critical thinking to their traditional lecture courses. However, there are some barriers, such as lack of time to prepare

the course and not knowing how to switch from a traditional lecture format to an interactive environment. (Heath & Weege 2017).

It is very important to develop strategies and methods to improve the critical thinking of nursing students as well as to increase the competence of nursing teachers. Teaching critical thinking to nursing students is important, and learning these skills should begin as early as possible. After all, these cognitive skills contribute to improving the health of patients. (Chan 2013).

Critical thinking is a process that uses different approaches to solve identified problems and requires the ability to use reflective thinking and logical problem solving. Critical thinking is an action consisting of elements of cognition and behavior. To achieve this level of thinking requires knowledge, time, and experience. However, since each student is unique in their critical thinking, nursing educators should treat students as individuals and use individual assessment methods to assess the level of critical thinking. In addition, a variety of assessment methods increases the validity and accuracy of the assessment. These assessment methods should also be incorporated into nursing courses. (Paul 2014.)

3 Developing critical thinking in nursing students

Critical thinking now plays an important role in nurse practice and training. The nursing faculty often reviews learning strategies that improve critical thinking and engage students in active learning. To support the development of critical thinking of students, teachers should continue to use different strategies that facilitate the learning required for critical thinking. To enable a student to change their way of thinking, teachers must create accessible ways to explain the changes needed. (Ward & Morris 2016.)

The goal of nursing education is to prepare a graduate nurse for the role of a professional nurse. In nursing students' training programs, it is important to include evidence-based nursing practice. (Mann 2010).

The development of critical thinking skills is necessary for solving complex health problems, and it is well developed through educational processes and collaborative and participatory training. (Drennan 2010.) According to Cazzell and Anderson

(2016), deduction is necessary for critical thinking and clinical judgment. When a nurse is trained in deductive skills, critical thinking and clinical judgment may improve. Different simulations can be used as a strategy to develop deductive skills. (Cazzell & Anderson 2016)

A successfully implemented educational program using a specific teaching method effectively contributes to the development of critical thinking and self-confidence of nursing students. Nursing teachers should have clear goals and plans for developing students' critical thinking. (Alamrani, Alammar, Alqahtani, & Salem 2018).

One of the methods of developing critical thinking and reducing theoretical discrepancies and practice in nursing classes is the use of various teaching methods. According to experts, current medical students are significantly different from medical students 10 years ago. Modern students are accustomed to technology and support studies carried out with the use of new technologies. Therefore, it is better to use various methods and techniques of conducting classes. (Shinnick, Woo, & Mentes 2011).

However, an easy way for students to develop critical thinking is to use real clinical scenarios. Real-life clinical scenarios also allow educators to move from the role of "sage on stage" to the role of "guide on the side". (Heath & Weege 2017). It simultaneously prepares students for clinical practice and helps to combine practical and theoretical education as well as helping them to become motivated and interested in the learning process. (Braeckman, 't Kint, Bekaert, Cobbaut, & Janssens 2014). At the same time, according to Borglin and Fagerström (2012), the development of writing, reading, thinking, and speech can contribute to the development of literacy and critical thinking of nursing students.

Real-life examples can be used to teach and assess students' knowledge about the processes and consequences of a disease. (Heath & Weege 2017.) Also, the small group learning method contributes to the modeling of critical thinking and the clinical judgment of nursing students (Wane & Lotz 2013).

The competence of nurses mainly depends on instructional methods and the possibilities for clinical practice. Problem-Based Learning (PBL) helps to improve knowledge, compared with the traditional method of teaching. The PBL method is a

good tool for the development of different skills and mental abilities of nursing students. (Mrunalini, Jonnada, & Chandekar 2015.) Written-reflective tasks have a good effect on the level of thinking. Studying the method of reflexive intervention revealed the need for the introduction of this method in the training course of nursing in medical institutions. According to research, it promotes critical thinking in students. (Naber & Wyatt 2014.)

The results of the literature review by Kenneth (2011) show that the use of the PBL method improves the critical thinking of nursing students. The use of PBL methods for nursing students in primary courses, as well as for nursing students in clinical practice, increases their critical thinking skills. (Kenneth, 2011).

PBL, concept map, modeling, reflective writing, and role modeling are methods for developing critical thinking in undergraduate students. Research has shown that PBL is the most effective of these strategies. This suggests that the use of active techniques in teaching nurses affects the level of critical thinking. (Bertacchini de Oliveira, Rueda Díaz, da Costa Carbogim, Baldacin Rodrigues, & de Araújo Püschel 2016).

In pedagogy, there is a model to strengthening student-teacher relationships—the practice of partnership and opportunistic relationships. This model is based on the student-teacher relationship. This aspect of the model is about relationships and interpersonal relationships, and it assumes that teachers need to develop partnerships with students, which serves to form critical thinking. When students are capable of learning, it is easier for teachers to share their critical thinking. It was also noted that the relationship between teacher and student is strengthened in an environment where clinical staff is responsive to students. (Raymond-Seniuk**,** Profetto-McGrath, Myrick, & Strean 2018).

The creation of various faculties in clinical settings aimed at teaching critical thinking skills and also to conduct seminars to support the development of these faculties. It is possible to reveal critical thinking nurses-teachers and students in clinical practice and in clinical training. (Raymond-Seniuk et al. 2018) Situational tasks based on learning also increase the level of critical thinking. Situational problems can be

formulated based on students' problems or problems that are difficult to solve, or topics that students do not understand. (Heath & Weege 2017.)

Shin, Ha, Shin, and Davis (2006) state that for nursing education, it is necessary to determine an educational objective that will promote the development of students' critical thinking abilities as well as develop syllabus, training program, educational program, and teaching methods to reach these goals. At the same time, clinical practice in nursing education should be undertaken in such a way that students can think critically, using their creative skills and problem-solving ability. (Shin et al. 2006)

There is a need to study teaching methods that affect the critical thinking of nursing students (Yuan, Williams & Fan 2008). Using reflection allows nurses to report, analyze their actions, make other alternative decisions, and implement new ideas. Therefore, effective use of reflection will be a useful way to increase the ability of nurses to think critically. Therefore, to improve the reflective method of teaching, mentors' training should be strengthened. To develop the use of reflection in the learning process, it is necessary, first of all, to train teachers-nurses. (Zhang, Fan, Xia, Guo, Jiang, & Yan 2017).

In the study by Zhang and colleagues (2006), Chinese students wrote personal professional portfolios as part of the reflective training method. It was noted that reflective learning with the help of professional portfolio positively affected the development of critical thinking. This professional portfolio has been applied before in some European countries and in the United States. Given the shortage of qualified nurse mentors and well-trained nurses in many other developing countries, it remains a challenge to develop and implement effective training programs on reflective training. (Zhang et al. 2017).

Courses in logical thinking develop critical thinking skills in nursing students. The nursing students who attended these courses had good critical thinking scores. In addition, a method of problem-based learning should be used by teachers of nursing care with the goal of improving clinical skills and problem-solving skills of student nurses. (Shin et al. 2006.)

Students themselves take part in the use and development of critical thinking as well. Awareness and understanding of the importance of this skill in school, work, or in

general may vary among students. This can be one of the reasons why some students score differently when measuring the level of critical thinking. In addition, the critical thinking construct assumes that critical thinking skills can be trained, modified, and developed. These skills should increase with the completion of the course along with the training program. (Hassan & Madhum 2006.)

Complementing nursing training with clinical practice leads to the development of skills such as cognitive skills, problem recognition, and problem solving. It was also found that simulation lessons could restore critical thinking skills in nursing students. (Sullivan-Mann, Perron, & Fellner 2009.)

A good relationship between a student and a mentor is essential for developing the critical thinking of a nursing student. Mentors generally assume a responsible role in training. They can promote nursing students in training and in relation to any environment. (Myrick & Yonge 2004).

Critical thinking is one of the main skills in the nursing profession, both in scientific and professional nursing practice. Especially when you need to develop research in nursing, critical thinking is the most necessary skill. To develop this skill, you will have to work together in a team. (Profetto-McGrath, Hesketh, Lang & Estabrooks 2003).

Developing critical thinking involves planning and implementing strategies throughout the nursing curriculum. To promote thinking skills during clinical practice, students could be required to draw up a concept map that reflects patient safety measures, communication methods, team building actions for various clinical conditions, and leadership skills. Reflection and questioning are some of the best practices that scientists consider effective in developing the criterion of critical thinking. (Burrell 2014).

Nurse managers or senior nurses can help to develop nurses' thinking by asking them to write a professional diary and then discuss it as a mentor which will also help new nurses engage in self-analysis and a new understanding of the problems they face, or professional perspectives, as well as their ability to solve problems. (Chang, Chang, Kuo, Yang, & Chou 2011.)

It is recommended that nurse educators be prepared to implement innovative and active teaching strategies. Then the results of the training with innovative technologies can be evaluated. Students' critical thinking needs to be measured in the learning process, and critical thinking skills must be measured using a validated questionnaire that matches critical thinking skills. (Azizi-Fini, Hajibagheri & Adib-Hajbaghery 2015).

There is no clear direction or method for developing critical thinking in the process of patient care on the part of teachers. Therefore, nursing teachers should review their teaching and evaluation methods and implement ones that promote critical thinking skills and aptitude. They should encourage students to switch to a student-centered approach by taking responsibility for the learning process. In order to provide critical thinking skills in a fundamental way, it is necessary to revise the curriculum. From the first years of the training course, it is necessary to ensure the development of critical thinking. In addition, it is recommended that further research be conducted to determine how critical thinkers are nurses-educators themselves, since no one can teach critical thinking if they are not critical thinkers. (Mangena, & Chabeli 2005).

According to Raymond and Profetto-McGrath (2005), nurse educators demonstrate the need to have a very high level of critical thinking and a propensity for critical thinking. In order to strengthen the critical thinking of nursing teachers, the following recommendations are presented:

1. Nursing programs should contain a structure in which teachers can discuss various aspects of critical thinking and how it can be applied in teaching practice.

2. Nursing programs should allow nursing educators to measure critical thinking skills and aptitudes as a means of developing self-esteem and self-education.

3. Nurse educators should research critical thinking and how it manifests in learning.

4 Development of critical thinking in nursing education in Kazakhstan

Modern medicine is developing dynamically and rapidly. In these conditions, the student must be able to think independently and be aware of where and how the

knowledge they acquire will be applied in the future. Accordingly, in modern conditions, teachers must not only give students knowledge but also ensure the formation and development of cognitive abilities and interests, creative thinking, skills and independent mental work, analyze various aspects of the disease, and adapt them to the future profession. This is where critical thinking technology comes to the rescue, which is based on the process of analysis, synthesis, and evaluation of information obtained through observation, experience, and reflection. This technology is one of the significant concepts that positively affect the development of education in Kazakhstan. The use of critical thinking technology in the classroom allows us to interest students, arouse their research and creative activity, and develop clinical thinking. Thanks to the development of critical thinking, students' knowledge as a future specialist is improved. (Azhaeva 2019, 77.)

Critical thinking allows you to not only make the work interesting but also effectively complete it. The use of critical thinking strategies helps to increase the level of knowledge and activity of students and to ensure that the learning process is interesting and emotional for the teacher and students. Critical thinking skills are necessary for understanding the main meaning in foreign language lessons, reading text and listening to information, discussing it and generalizing your own thoughts. (Abugalieva 2019.)

A clinical guideline has been developed for nursing students at all levels of education (academic and applied baccalaureate, technical and traditional nursing education). For students of any degree of education there is a frame of competences of the graduate of the program of applied bachelor's degree in the specialty "Nursing". Nursing students' competencies are divided to Basic and professional competencies. In the guideline, it is stated that critical thinking and decision-making is one of the basic competencies in training. This competency is described as skills to identify the problem and potential solutions, logically analyze facts and judgments, test hypotheses and assess the probability of events, and draw conclusions and make informed decisions. Also, in the competencies of the academic bachelor of nursing, critical thinking is indicated as a necessary skill in mastering the basic competence. (Heikkila, Tiittanen, & working group of higher medical colleges 2019.)

On approval of state mandatory standards and standard professional training programs for medical and pharmaceutical specialties (2015), the order of the Ministry of health and social development of the Republic of Kazakhstan claimed that the standard period of study of the educational program of post-secondary education with the qualification of "applied bachelor" in the specialty "Nursing" on the basis of General secondary education is 3 and a half years full-time, whereas on the basis of technical and vocational education on the accelerated training program it is 1 and a half years. The period of development of technical and professional knowledge in the field of nursing is 2 years 10 months or 3 years 10 months, depending on the basic education. To master the applied bachelor's degree in nursing takes 3 and a half years, and to master the educational program of technical and vocational education, a basic level of basic secondary or General secondary education is required. To master the applied bachelor's degree in nursing in 1 and a half years, you must have a technical and professional education in the specialty " Nursing "or the qualification "Paramedic" and a certificate of a specialist in the specialty "Nursing" and work experience of at least three years. Training programs for applied bachelor's degree are carried out using credit technology. Applied baccalaureate teachers should be scientific and pedagogical specialists with higher education (including graduate medical education), corresponding to the profile of disciplines and systematically engaged in pedagogical, scientific-methodical activities, as well as a qualified medical practitioner, qualified in Nursing or appropriate teacher training on a specialty "Nursing" qualification, "applied bachelor". (On approval of state mandatory standards and standard professional training programs for medical and pharmaceutical specialties 2015).

5 Purpose, Aims, and Research Questions

The purpose of this study is to investigate the critical thinking of applied undergraduate and traditional nursing students at the graduate level of education, and to give recommendations based on the results to teachers of medical colleges in Kazakhstan.

Aims of this study:

a) to examine the critical thinking skills of graduate students of applied bachelor's in nursing
b) to examine the critical thinking skills of graduate students of traditional education
c) compare the level of critical thinking of nursing students

Research Question:

What is the level of critical thinking among nursing students at different levels of education?

Hypothesis

Applied bachelors of nursing have a higher level of critical thinking than college level nurses.

6 Methodology

6.1 Research approach and design

This research was conducted using the quantitative method. According to Brown (2018, 54), quantitative research is explaining phenomena by collecting numerical data that are analyzed using mathematically based methods (especially statistics) and empirical propositions, and the research is conducted as social research. Typically, empirical statements are expressed in numerical terms. Another factor in quantitative research is that empirical estimates are applied.

The first element is the explanation of the phenomena, which is the key element of all research. When research is carried out, its purpose is to explain something. It could be a question. Numerical data is collected in quantitative studies. This is due to the analysis of data using mathematically based methods. To be able to use mathematically sound methods, our data must be in numerical form. (Muijs 2011, 1-2.)

The design of this study was observational, descriptive, and cross-sectional. This type of research design serves one purpose: to describe the distribution of certain characteristics simultaneously. A single-stage cross-sectional study is aimed at

detecting the propagation of the characteristic under study at a certain point in time or in a very short period of time. The principle of simultaneous cross-sectional study is to collect a common sample from the population. (Shalkharova 2017, 70). In order to find an answer to a research question, that is, to determine the level of critical thinking, students are studied at a single time without the participation of the lead researcher, so this construction is suitable for this study. (Kholmatova, Gorbatova, Kharkiv, & Grzybovsky 2016).

6.2 Instrument

Critical thinking is a central concept introduced in the curriculum objectives of each clinical course of the undergraduate curriculum. It is important that nursing students' critical thinking skills are evaluated throughout their study. Although, these skills are difficult to assess. (Beckie, Lowry, & Barnett 2001). Determining the level of critical thinking using a reliable tool allows employers of new graduates to be confident that graduates have certain critical thinking skills. This, in turn, allows for safe patient care. In addition, a reliable tool for determining critical thinking affects the improvement of students' knowledge in the field of nursing. (Jacob, Duffield, & Jacob 2018).

Measuring critical thinking is quite complex but there are still many kinds of tools to achieve this. Given the differences in critical thinking assessment tools, they can be classified as standardized tests, tests developed and evaluations conducted by a teacher, tests developed by researchers, and secondary-source measures. (Abrami, Bernard, Borokhovski, Wade, Surkes, Tamim, & Zhang 2008).

Many standard-designed tests are used to measure critical thinking and have high evidence. Standard tests for measuring critical thinking include Californian Critical Thinking Disposition Inventory (CCTDI), Californian Critical Thinking Test (CCTST), Health Sciences Reasoning Test (HSRT), Watson-Glaser Critical Thinking Appraisal (WGCTA), and Critical Thinking Assessment (CTA). (Carter, Creedy, & Sidebotham 2015). Of these, two are designed specifically for the nursing field: The Critical Thinking Assessment (CTA) and The Health Sciences Reasoning Test (HSRT).

The Critical Thinking Assessment (CTA) is designed specifically for nursing students to evaluate critical thinking skills. Test questions are standardized and follow clinical reasoning. (Mann 2012). Cronbach's alpha is 0.69 and the standardised item alpha 0.70. (Jones, & Morris 2007.) The Health Sciences Reasoning Test (HSRT) estimates reasoning skills—in addition to standard information about students, such as students' skills related to critical thinking. The validity of HSRT is the same as other standard tests for measuring or evaluating critical thinking skills. (Huhn, Black, Jensen, & Deutsch 2011). Even if standardized tests for critical thinking nursing are more reliable, their application in this study was impossible due to the lack of Kazakh or Russian versions.

Therefore, a questionnaire was used to determine critical thinking, compiled by researchers Zuriguel Perez, Falcó Pegueroles, Roldán Merino, Agustino Rodrigues, Gómez Marting and Lluch Canut (2017) for measuring the critical thinking of nurses. The questionnaire was developed based on the 4-Circle CT Model of Alfaro-LeFevre and a previous research conducted by Zuriguel Perez and colleagues (2014). Zuriguel Perez and colleagues (2017), presented a 4-circle model of critical thinking based on the work of Alfaro-LeFevre (2016) where personal characteristics contain elements (relationships, values) that activate critical thinking. Intellectual and cognitive abilities are knowledge and understanding of actions related to the care and decision-making process. Interpersonal characteristics and self-management are abilities that allow you to implement communication skills and obtain information that is relevant to the patient. Technical skills are knowledge and experience in performing procedures in the field of nursing.

The tool Zuriguel Perez and colleagues (2017) developed is called the Nursing Critical Thinking in Clinical Practice Questionnaire (N-CT-4 Practice), and it was first created in Spanish and consists of 112 items that are distributed according to four criteria. To check the content of the developed questionnaire, it is sent to a commission consisting of six clinical practitioners and educational experts working in the field of critical thinking. Experts are asked to evaluate the feasibility and inexpediency of each item on a four-point scale from inappropriate (1) to the most acceptable (4). In addition, experts were asked to make suggestions for improving items that do not correspond in content. After the review of the experts, a total of 109 items were

included in the questionnaire. All items are divided into 4 key elements of critical thinking: personal (39 items); cognitive and intellectual (44 items); interpersonal relationships and self-management (20 items); and technical (6 items). The answer is in the Likert format for each item - never or almost never (1) always or almost always (4), so the respondents will note how much critical thinking is needed in professional clinical situations. Items and content validity index were >0.78 and the scale level content validity index > 0.80. The content of the questionnaire was considered a high indicator of reliability. (Zuriguel Perez et al. 2017.).

In this research the critical thinking level of nursing students was calculated using an average value. According to Zuriguel Pérez, Falcó Pegueroles, Agustino Rodríguez, Gómez Martín, Roldán Merino, and Lluch Canut (2019) three levels of critical thinking were set for the overall average score: low level for scores (<329), moderate level (between 329 and 395) and high level (> 395).

The questionnaire for students consists of two parts: demographic questions and questions for measuring critical thinking. According to Zuriguel Pérez and colleagues (2019), critical thinking skills in nurses are associated with certain socio-demographic and professional activities, such as age of nurses, years of experience in the present unit, shift work, and educational level. These questions are important to determine which groups of nurses have a good level of critical thinking, which groups need to improve critical thinking skills, and which dimension need to improve these skills. (Zuriguel Pérez, et al. 2019).

Taking these characteristics into account, the demographic part of the survey was made up of the following questions: age, gender, name of college, degree of education, passing certification exam, years working as nurse, working unit, position at work, shift work, and experience in current unit (Appendix 4).

6.3 The process of questionnaire translation

The translation process begun with a complete review of the questionnaire form. Creating comparable versions in different languages requires a project team. The project team may include a researcher, health experts, and experts with experience in developing and translating tools. Translators must be fluent in the English culture,

but the main language must be the language of the target culture. In the process of translation, the following must be taken into account: the desire for conceptual equivalence of a word or phrase more than a literal translation. Questions that have been translated should be obvious and short, avoiding long sentences with multiple paragraphs. The smaller the word, the better. After reading or listening to the questionnaire, the questions should be clear. Translation using jargon, speech, and idioms is not allowed. The conclusions obtained from the analysis should be discussed by the developer for confirmation or clarification. Any identified potential problem points, interpretations, and alternatives should be discussed and agreed upon. (Gorecki, Brown, Briggs, Coleman, Dealey, McGinnis, Nelson, Stubbs, Wilson, & Nixon 2014).

The process of translating the questionnaire N-CT-4 Practice was carried out jointly with the supervisor and a professional translator. All 109 items were reviewed separately and translated into Kazakh and Russian with English meaning.

6.4 Sample

The target audience of this study was nursing students of higher medical colleges in Kazakhstan and graduates of nursing. Due to the lack of graduates of the applied bachelor of nursing, who have completed the 3.5-year education, this year the sample included graduate students of the Department of technical and vocational education in nursing and graduates of the 1.5-year program of the applied bachelor of nursing (who graduated in February 2020 and received a diploma).

The following higher medical colleges of Kazakhstan were selected for the survey of these students:

1) Higher medical College of the city Akimat, Nur-Sultan
2) Kokshetau higher medical College
3) Pavlodar higher medical College
4) West Kazakhstan higher medical College
5) Turkestan higher medical College
6) Higher multidisciplinary medical College "Turkestan”
7) Aktobe Higher medical College named after hero of the Soviet Union Manshuk

The total number of graduates of nursing students was 1,562 students. Of these, 1,109 are graduates of traditional education and 453 are graduates of the applied bachelor's degree of rooted education. (See Table 1.)

Table 1. The number of graduates of undergraduate nursing students

Collegeas	**Traditional nurses**	**Applied bachelors**
Higher Medical College of Nur-Sultan;	200	21
Kokshetau higher medical College;	96	25
Pavlodar higher medical College;	100	43
West Kazakhstan higher medical college.	241	47
Higher multidisciplinary medical College "Turkestan»	87	163
Turkestan higher medical College	220	130
Aktobe Higher medical College named after hero of the Soviet Union Manshuk Mametova	165	24
Total	**1109**	**453**

According to Kholmatova and colleagues (2016), it will take too long to interview the entire population in a cross-sectional study. In our case, from 1,562 students, it was necessary to form a minimum sample of students, which is enough in order to be able to generalize the results obtained to all postgraduate nurses. For this purpose, Kholmatova colleagues (2016), offers a number of statistical programs. There was no information about the expected level of critical thinking among students, so the online calculator RaoSoft was used (http://www.raosoft.com/.) A free sample size calculator was selected, where one only needs to enter the accuracy level of the estimate (5%), the confidence interval value (95%), and the population size. However, the required sample subtracted from the formula is not the final sample size, since some participants may refuse to participate in the study, some may not complete the questionnaires completely, and so on. Taking these points into account, when calculating the sample, it is customary to increase its volume by 15-25 % from the original (Kholmatova et al. 2016).

The level of confidence usually aimed for is 95%, and most researchers present their results with a 95% confidence interval. However, researchers who wish to be more confident can choose a 99% confidence interval (Pourhoseingholi, Vahedi, Rahimzadeh 2013). The level of statistical significance (alpha), most researchers set as 0.05, which means that one accepts a 5% chance of detecting an association or difference where there is none—a false positive result. The level of statistical power

of the study most researchers set as 0.80, hence Beta = 1–0, 80 = 0.20, meaning that one accepts a 20% chance of a false negative result. (Shalkharova 2017, 89).

Since there were two independent sample groups, the minimum size for each group was needed separately. The total number of applied bachelors was 453, error was 5%, and confidence level 95%. In other words, for applied bachelors, the minimum size for a representative sample was 209: 25% - 209*25%=261. Traditional nursing students: General population 1,109, error 5%, and confidence level 95%. That is, for traditional students, the minimum size for a representative sample was 289, adding 25%: - 289*25% - 361. We see that in this case, the size of the estimated sample is larger and amounts to 622 students. This means that this is the minimum size of the survey. If a sample was created from this number of students, it would be more likely to get the correct answer than from a large sample, where only a small percentage of the sample responds to the survey.

6.5 Ethics

This research work was approved by the ethical committee of the Kazakh medical University of Continuing Education. The directors of the above-mentioned higher medical colleges of Kazakhstan were sent a letter of admission of nursing students to participate in research work (Appendix 2). Due to the transition to distance learning, some of these colleges refused to participate in the study. Continued working with colleges that agreed on the survey of students.

Standards for the protection of research participants are: prevention of harm to participants, their consent, and confidentiality of information about them. To ensure the effectiveness and relevance of the study, the researcher must protect the participants as a whole. (Clark 2019). Therefore, before the survey, participants were informed that their participation is voluntary and anonymous, their response to which is stored confidentially on the researcher's computer, which has its own password (Appendix 3) . After completing the survey, all collected data is safely deleted.

6.6 Data collection and analysis

After obtaining consent to the survey among students, information was received from the heads of colleges about the number of graduates of the Department of technical and professional education in nursing and applied bachelor's degree in nursing, as well as their individual numbers for WhatsApp. Links to the questionnaire were sent to individual WhatsApp numbers as well as to a chat of WhatsApp students at some higher medical colleges. Links to questionnaires for graduate nursing courses at Kokshetau Higher Medical College were included in the Moodle platform. Data was collected in April 2020. The questionnaire was conducted in electronic form using the Webropol program.

All collected data were processed using the Statistical Package for the Social Sciences program 26 (SPSS 26). Using descriptive statistics, the socio-demographic status of participants was revealed. The average value of each survey dimension was calculated and placed in tables, and the items with the highest and lowest average values were separately described.

To determine the statistical differences in the demographic statuses between the two groups, the Chi-square test and the U-Mann-Whitney test were used to compare the two independent groups. The independence criterion is one of the most useful statistical indicators for testing the Chi-square hypothesis, with variables being nominal, often found in clinical studies. Unlike many statisticians, the Chi-square can provide information about the significance of any observed differences. The Chi-square test is not a parametric statistic. (McHugh 2013)

One of the most important tests when comparing two independent groups is the U-Mann-Whitney test. The Mann-Whitney test is used to compare two independent groups, especially when there are no normally distributed variables (Nachar 2008). Group independence means that the study is conducted in two sampling groups, with no similarities between the study groups. (Iljin 2011).

For the demographic data of the two groups, the statistical significance for the Chi-square criterion was $p>0.01$, meaning that there were statistically significant differences. Comparing the level of critical thinking of two groups on the U-Mann-Whitney test, all items except seven had significant difference by mean value.

Based on the results of a survey of two separate groups, the average points of items on each dimension were calculated. Items with high, medium, and low scores are marked by the average score. For example, for each item of the personal dimension, graduates of applied bachelors in nursing had a low score of < 3.30, an average score of 3.30–3.50, and high score of ≥3.50.

6.7 Reliability and validity

Many tools for determining the level of critical thinking are not designed specifically for the nursing profession or are designed to measure critical thinking in order to evaluate a specific educational outcome. However, until now, proven tools that clearly and adequately account for critical thinking skills are not available, so the N-CT-4 Practice is an important new development in the measurement of critical thinking. The results obtained in the study by Zuriguel Perez and colleagues (2017) show that the N-CT-4 Practice experiment has good psychometric properties. The questionnaire was very viable, has good stability over time, and the structure of the questionnaire is acceptable. (Zuriguel Perez et al. 2017).

According to a study by Zuriguel Perez and colleagues (2017), the overall correlation of many items was >0.20. Only the correlation of items 3, 5, and 70 was <0.20. But in the general calculation, these items did not reduce the reliability of the survey. Intraclass correlation coefficient for the instrument was 0.77. Thus, all the items in the questionnaire were significant. (Zuriguel Perez et al. 2017).

According to Bacon-Shone (2015, 54), the validity of the questionnaire depends on whether it measures the research concept and has value as a measuring tool for this concept. Thus, the N-CT-4 Practice is a research tool that can be used to assess the level of critical thinking in nursing practice (Zuriguel Perez et al. 2017).

In this study, Cronbach's alpha was measured for all items and dimensions of the questionnaire. According to Cronbach's alpha, all 109 points and sub dimensions are considered 0.990, which means that the Cronbach alpha for this questionnaire is very good, and the questionnaire is highly reliable.

7 Results

7.1 Socio-demographic characteristics of participants

The total number of participants was n = 449. Most (n =408) of the respondents were women and one tenth (41) were men. Among all participants, 48.6% (n = 218) were graduates of applied bachelors in nursing, and 51.4% (n = 231) were future graduates of technical and professional education courses in nursing. For all demographic data from the two groups, the statistical significance for the Chi-square criterion was p>0.01, meaning that there were statistically significant differences.

In the group of applied bachelors, most (97.7%) were women, and the mean age was 36.8 years (range 18–57). Among them, 60.1% of the respondents were from the Higher multidisciplinary medical College Turkestan. Almost all (92.2%) had passed the certification exam. Nearly half (43.5%) worked in a hospital and more than half (61.4 %) worked the day shift. Half of the respondents (51.8%) worked as a general nurse. As for work experience, more than a quarter (26.1%) had been working as a nurse for more than 20 years, quarter (25.2 %) had worked in the current unit from 1 to 5 years. (See Table 2.)

Table 2. Sociodemographic characteristics of the graduates of applied bachelors in nursing (n= 218)

Variables	Characteristic	n	%	p-value
Gender				0.00
	Female	213	97,7	
	Male	5	2,3	
Age				0.00
	17–25	26	11.9	
	26–35	91	41.7	
	36–45	51	23.4	
	46–60	50	22.9	
Name of college				0.00
	Kokshetau higher medical College; Pavlodar higher medical College;	16	7,3	
	Turkestan higher medical College	37	16,9	
	Higher multidisciplinary medical College Turkestan	131	60,1	
	Aktobe Higher medical College named after hero of the Soviet Union Manshuk Mametova	26	11,9	
Passing certification exam				0.00
	Yes	201	92,2	
	Not at all student	14	6,4	
Experience as nurse				0.00
	no experience/student	9	4.1	

	less than one year	4	1,83	
	from 1 to 5 years	48	22,01	
	from 5 to 10 years	42	19,2	
	from 10 to 15 years	36	16,5	
	from 15 to 20 years	22	10,09	
	more than 20	57	26,1	
Working unit				0.00
	Hospital	95	43.5	
	clinic	20	9.1	
	dispensary	19	8,7	
	ambulatory	13	6,0	
	outpatient department	57	26,1	
	Not at all/student	13	6,0	
Position of				0.00
	General nurse	113	51,8	
	Senior nurse	30	13,7	
	Applied bachelor	37	16,9	
	Not at all/student	11	5,04	
Shift work				0.00
	Day (8 h)-Full time	134	61,4	
	Night (16 h)-Full time	14	6,4	
	Mixed	53	24,3	
	Part time	6	2,7	
	Not at all/student	11	5,04	
Experience in current unit				0.00
	no experience/student	7	3,5	
	less than one year	19	8,7	
	from 1 to 5 years	55	25,2	
	from 5 to 10 years	44	20,1	
	from 10 to 15 years	28	12,8	
	from 15 to 20 years	35	16,05	
	more than 20	30	13,7	

In the group of future graduate nurses of technical and professional education, most (84.4%) were women and the mean age was 20 years (range 17–34). The most respondents from one college (28,1%) were from the Aktobe Higher medical College named after the hero of the Soviet Union, Manshuk Mametova and Kokshetau higher medical College (24,2%). (See Table 3.)

Table 3. Sociodemographic characteristics of the future graduate nurses of technical and professional education (n= 231)

Variables	**Characteristic**	**n**	**%**	**p-value**
Gender				**0.00**
	Female	195	84,4	
	Male	36	15,6	
Age				0.00
	17–25	219	94.8	
	26–35	12	5.2	
Name of college				0.00

	Higher medical College "of the city akimat, Nur-Sultan»	36	15,5	
	Kokshetau higher medical College;	56	24,2	
	Pavlodar higher medical College;			
	West Kazakhstan higher medical college.	4	1,7	
	Turkestan higher medical College	4	1,7	
	Higher multidisciplinary medical College Turkestan	26	11,25	
	Aktobe Higher medical College named after hero of the Soviet Union Manshuk Mametova	65	28,1	
	Republican Higher Medical College	40	17,3	
Passing certification exam				0.00
	Not at all student	225	97,4	
Experience as a nurse				0.00
	no experience/student	215	93,07	
	less than one year	13	5,6	
Working unit				0.00
	Not at all/student	224	96,9	
Position of				0.00
	Not at all/student	226	97,8	
Shift work				0.00
	Not at all/student	225	97,4	
Experience in current unit				0.00
	no experience/student	223	96,5	
	less than one year	4	1,7	

7.2 Critical thinking skills of graduate students of applied bachelor of nursing

7.2.1 Applied bachelor graduates' critical thinking on the personal dimension

Applied bachelor graduates mean score of personal dimension of the N- CT- 4 Practice Questionnaire was 100,5, SD = 21.9. In items of personal dimension, the maximum average value was 3.77, and the minimum average value was 2.34. The highest level of average value (3.77) were in items 19 ("I take responsibility for my own actions") and 38 ("I promote patient health"). However, in item 38, the standard deviation was also high (7,551). The lowest average value (2.34) was in item 3 ("I show my feelings to others"). The same high (≥3.50) indicator was with items, 4, 11, 16, 17, 19, 21, 25, 30, 32, 33, 38, 39, and closer to the minimum average (≤3.30) were items, 3, 6, 7, 13, 34. All other items had average indicators (3.30-3.50). This means that there was 12 items with a high (>3.50) average value and 5 items with a low (≤3.30) average value. The high values of the average value in this dimension are greater than the low values. As for the standard deviation, its range in items was from -0,401 to 7,551. But on almost all other points, the standard deviation did not exceed 1. (See Table 4.)

Table 4. Descriptive statistics of items in the personal dimension of N-CT-4 Practice (graduates of applied bachelors, n = 218)

№	Items	Mean	Std.deviation	P-value
3	I show my feelings to others.	2.34	1.00	0.001
7	I look for alternative responses when I am faced with one that isn't satisfactory.	2.95	0.92	0,00
13	I am aware of when I am acting in an impulsive manner.	3.11	0.94	0.001
6	It is easy for me to understand how others feel.	3.14	0.862	0,00
22	I accept that there is more than one way to approach life.	3.20	0.88	0.019
28	I create chances for improvement and offer innovations.	3.27	-.395	0,00
34	I don't impose my own thinking on others, and I see myself as open to change.	3.30	0.116	0,002
24	I accept cultural differences in people's responses to situations.	3.31	0.84	0,00
31	The greater the chance of failure in an undertaking, the likelier I am to go ahead.	3.31	-.401	0,00
2	I know my strengths and weaknesses.	3.32	0.86	**0.201**
1	I recognize my own emotions.	3.34	0.88	**0.005**
8	I identify the time and place to evaluate my performance and make improvements.	3.34	0.80	**0,00**
5	I know how to put myself in the place of others to see how they feel.	3.38	0.81	0,00
23	I make decisions in an objective manner.	3.40	0.73	0,00
20	I consider myself to be meticulous in my actions.	3.41	0.83	**0,00**
29	I act when I have the chance to do so.	3.41	0.022	0,00
12	I act in a reasoned, step-by-step manner.	3.42	0.77	0,00
18	I initiate and complete tasks on my own.	3.43	0.77	0,00
15	I see problems as challenges to be overcome, and not as threats.	3.43	0.80	0,00
14	I believe in myself and in others and act accordingly.	3.44	0.79	0,00
9	When I have information, I try to interpret it before jumping to conclusions.	3.45	0.71	0,00
37	I look for self-improvement in my way of thinking.	3.45	0.229	0,00
46	I see myself as having a healthy lifestyle.	3.46	-.218	0,00
10	Before acting I reflect upon the advantages and disadvantages of my decision.	3.48	0.68	0,00
27	I consider the consequences before taking action.	3.48	0.468	0,00
26	I look for solutions appropriate to each situation.	3.49	0.902	0,00
36	I encourage others to follow a healthy lifestyle.	3.49	0.988	0,00
16	I believe that I act in a firm manner.	3.50	0.73	0,00
17	My behaviour is firm.	3.50	0.75	0,00
20	I consider myself to be prudent in my actions.	3.55	0.70	0,00
25	I look for real solutions to problems.	3.55	2.10	0,00
39	I promote action in the organization designed to improve safety and quality.	3.56	1.196	0,00
11	I think before I act.	3.57	0,68	0,00
33	I see myself as persistent in trying to reach my goals.	3.59	1.610	0,00
30	I remain loyal to my values in the face of opposition from others.	3.61	2.946	0,00
32	I know how to be patient in achieving my goals.	3.61	2.146	0,00
4	I am faithful to my principles and values.	3.72	0.64	0.00
19	I take responsibility for my own actions.	3.77	0.56	0,00
38	I promote patient health.	3.77	7.551	0,00

7.2.2 Applied bachelor graduates' critical thinking on the intellectual and cognitive dimension

Applied bachelor graduates' mean score of the intellectual and cognitive dimension of the N- CT- 4 Practice Questionnaire was 154,1, SD = 32,3. In items of intellectual and cognitive dimension, the maximum average value was 3.74, and the minimum average value was 3.04. The highest level of average value (3.74) were in items 49 ("I respect the privacy and confidentiality of the patient") and 51 ("I take the actions needed to prevent risk to patients"). The lowest average value (3.04) was in item 39 ("I use the documented information resources in a critical manner"). The following items also had a high indicator (>3.50): 41, 44, 45, 46, 47, 48, 49,50, 51,52, 56, 60, 62, 63, 66, 67, 68, 70, 76, 82, and 83. Closer to the minimum average (≤3.30) were items, 74, 77, and 78. So, 21 items had a high average value (>3.50), 3 items with a low (≤3.30) average value; all the other items (15 points) were moderate average values in this dimension, thus, there were more high values than low values. As for the standard deviation, its range in items was 0.52–0.94. (See Table 5.)

Table 5. Descriptive statistics of items in the intellectual and cognitive dimension of N-CT-4 Practice (graduates of applied bachelors, n = 218)

№	Items	Mean	Std. deviation	p-value
78	I use the documented information resources in a critical manner.	3.04	0.97	0,018
77	I am able to distinguish between situations that represent ethical conflicts and those that do not.	3.12	0.94	0,00
74	I modify the plan of care in accordance with the patient's state.	3.19	0.91	0,001
75	I carry out actions designed to promote the health of patients and their families or caregivers.	3.32	0.86	0,016
54	I use strategies designed to encourage the participation of patients and their families or caregivers in the decision-making regarding patient health.	3.35	0.84	0,025
42	I have the knowledge needed to deal with the psychosocial aspects of the patients.	3.39	0.87	0,00
40	I have the scientific knowledge required to carry out my professional practice.	3,34	0,91	**0,00**
79	I use evidence based information resources to support my clinical practice.	3.34	0.78	0,002
58	I decide when data outside the normal limits may be signs or symptoms of specific problems.	3.37	0.77	0,005
65	I determine the causes and factors underlying the problems.	3.39	0.77	0,014
43	I apply knowledge derived from scientific evidence in carrying out care.	3.42	0.83	0,001
59	I identify what information may be relevant to understanding a specific health problem.	3.42	0.77	0,001

	61	I am able to recognize contradictions between the subjective and objective data.	3.42	0.76	0,002
	69	I decide upon the interventions appropriate for achieving the expected outcomes (results).	3.44	0.79	0,00
	73	I am able to predict possible patient complications and to being appropriate preventive measures.	3.45	0.76	0,00
	64	On the basis of the data collected I identify the current and potential problems of the patient.	3.46	0.75	0,002
	71	I recognize changes inpatient health status.	3.46	0.73	0,00
	72	I am able to interpret the signs and symptoms that may be indicative of complications in a patient's state.	3.46	0.79	0,00
	80	I understand which of my abilities will be useful in achieving what I set out to do.	3.46	0.76	0,002
	55	I carry out systematic, careful assessment in order to collect the information needed to identify health problems.	3.47	0.75	0,081
	57	I observe which patient signs or symptoms are within normal limits, and which ones are not.	3.47	0.73	0,016
	81	When I have assimilated newly learned material I try to analyse how I came to learn it.	3.48	0.75	0,00
	53	I choose among different alternatives, examining the consequences of each.	3.49	0.71	0,00
	56	I obtain the data that are key to determining the factors that may play a role in the care of patients.	3.50	0.71	0,010
	60	I compare what the patient says (subjective data) with what I observe (objective data).	3.50	0.63	0,00
	62	I analyse the data and identify possible omissions.	3.50	0.70	0,00
	68	I consider the patient and the family or carer to be central figures when making decisions about the management of patient health.	3.50	0.77	0,00
	70	I treat interventions and nursing actions one by one in order to prevent or control problems.	3.51	0.76	0,00
	83	I share the mission, vision, and values of my organization.	3.51	0.74	0,00
	44	I am able to communicate effectively.	3.55	0.74	0,00
	66	I identify the results that I expect to observe in the patient following the care process.	3.56	0.67	0,00
	76	I try to educate patients how to prevent heath complications.	3.56	0.66	0,00
	82	When I need to learn something I know to proceed to learn it.	3.59	0.64	0,00
	41	I have the theoretical basis in nursing methodology needed for my professional practice.	3,60	0,68	0,00
	67	I prioritize the actions to be taken on the basis of each patient's situation.	3.63	0.68	0,00
	50	I am able to commit myself to realizing the values of the profession.	3.64	0.66	0,00
45		I fill out nursing records in a complete, rigorous manner.	3.65	0.68	0,00
	46	I believe that the people that I look after are equal regardless of social or cultural differences.	3.66	0.67	0,00
	48	I carry out professional practice based on the principle of respect for the rights of the patient.	3.66	0.63	0,003
	47	I provide safe, competent, and compassionate care.	3.67	0.63	0,00
	63	When the information available is incomplete I look for whatever else is needed in order to better understand the clinical situation.	3.67	0.69	0,00
	52	I try to guarantee patient and wokplace safety.	3.73	0.57	0,00
	49	I respect the privacy and confidentiality of the patient.	3.74	0.55	0,002
	51	I take the actions needed to prevent risk to patients.	3.74	0.52	0,00

7.2.3 Applied bachelor graduates' critical thinking on the interpersonal and self-management dimension

Applied bachelor graduates' mean score of interpersonal and self-management dimension of the N- CT- 4 Practice Questionnaire was 69,3, SD = 15,2. In items of

interpersonal and self-management dimension, the maximum average value was 3.58, and the minimum average value was 3.31. The highest level of average value (3.58) was in item 94 ("I share my experiences with the nursing team in order to achieve common goals"). High indicators (>3.50) were in points 89, 94, and 96, low indicators (≤3.30) were not present. Almost all points were at the average level. Also, in this dimension, the average value of 3.50 is more common (items 89, 92, 93, 95, and 101). As for the standard deviation, its range in items was 0.65–0.84. (See Table 6.)

Table 6. Descriptive statistics of items in the interpersonal and self-management dimension of N-CT-4 Practice (graduates of applied bachelors, n = 218)

№	Items	Mean	Std. deviation	p-value
88	I apply strategies to resolve conflicts arising from relations between the patient and family/carer, when necessary.	3.31	0.84	0,001
98	I use critical thinking in order to propose new solutions to problems that have been identified.	3.31	0.82	0,102
91	I use strategies designed to resolve conflicts arising from professional relations.	3.35	0.86	0,005
87	I use strategies designed to enhance the empowerment (increasing capacities and involvement) of the patient and family/carer in the care process.	3.37	0.82	0,002
99	I delegate tasks in line with the knowledge, abilities, and skills of the people who will carry them out.	3.37	0.80	0,001
84	I adapt information to the needs and capacities of the patient.	3.39	0.80	0,00
97	I use strategies (establishing priorities, organizing time, organizing the workplace) in order to better manage time.	3.41	0.77	0,00
90	I use strategies designed to enhance the empowerment of the members of the professional team.	3.44	0.79	0,00
102	I am able to manage a professional group to achieve stated goals.	3.44	0.80	0,00
85	I offer emotional support to the patient and family/carer.	3.47	0.78	0,002
86	I defend the rights of the patient and family/carer.	3.47	0.74	0,003
89	I defend the rights of the professional team.	3.50	0.71	0,00
92	I adapt to organizational changes in my workplace.	3.50	0.75	0,00
93	I try to assist in the adaptation of others in the work team to organizational changes in the workplace.	3.50	0.72	0,00
95	I share my experiences with other professionals in order to achieve common goals.	3.50	0.72	0,00
101	I try to have a positive influence on other members of the professional team so that they can achieve the goals that have been set.	3.50	0.72	0,00
96	I am able to optimally manage my time.	3.54	0.68	0,00
103	I am able to help contribute to a healthy working environment.	3.57	0.70	0,00
94	I share my experiences with the nursing team in order to achieve common goals.	3.58	0.69	0,00
100	I carry out follow-up of the delegated tasks.	3.63	0.65	0,00

7.2.4 Applied bachelor graduates' critical thinking on the technical dimension

Applied bachelor graduates' mean score of technical dimension of the N- CT- 4 Practice Questionnaire was 21.2, SD = 4,2. In items of technical dimension, the maximum average value was 3.73, and the minimum average value was 3.28. The highest level of average value (3.73) was in item 108 ("I administer medication in a safe manner (dose, preparation, and handling of instruments to administer the medication)"). The lowest average value (3.28) was in item 104 ("In the event of clinical uncertainty I know how to obtain reliable information from the scientific databases"). In this dimension, 3 items had high average values (3.60–3.70), and 2 items had average values (3.44 and 3.49). As for the standard deviation, its range in items was 0.60–0.88. (See Table 7.)

Table 7. Descriptive statistics of items in the interpersonal and self-management dimension of N-CT-4 Practice (graduates of applied bachelors, n = 218)

№	Items	Mean	Std. Deviation	p-value
104	In the event of clinical uncertainty I know how to obtain reliable information from the scientific databases.	3.28	0.88	0,001
105	I possess skills in the use of information and communication technologies needed to produce optimal professional results.	3.44	0.75	0,00
106	I am able to carry out needed techniques and procedures, relevant to the complexity of each case.	3.49	0.73	0,00
107	I match the procedure to be done with the appropriate context for carrying it out.	3.61	0.70	0,00
109	I carry out the care associated with administering medication (assessing the therapeutic response, previous and subsequent monitoring) in the correct manner.	3.70	0.60	0,00
108	I administer medication in a safe manner (dose, preparation, and handling of instruments to administer the medication).	3.73	0.60	0,00

As for the results of the overall average score for each dimension of the questionnaire for graduate nurses of applied bachelors showed a higher average score in the intellectual and cognitive dimensions (154.1) and technical dimensions (21.2). In the personal (100.5) and Interpersonal and self-management dimensions (69.3), the average scores were slightly lower. Consequently, the mean score of critical thinking skills of graduate students of applied bachelor of nursing in four dimensions was 345 and SD = 73,8. The range of total scores ranges from 109–436. Thus, graduate students of applied bachelor of nursing critical thinking skills is at moderate level (345).

7.3 Critical thinking in graduate students of traditional education

7.3.1 Future graduate nurses' of technical and professional education descriptive statistics of personal dimension

Future graduate nurses' of technical and professional education mean score of personal dimension of the N- CT- 4 Practice Questionnaire was 88.42, SD = 26.6. In items of personal dimension, the maximum average value was 3.33, and the minimum average value was 2.13. The highest level of average value (3.33) was in item 4 ("I am faithful to my principles and values"). The lowest average value (2.13) was in item 3 ("I show my feelings to others"). Points, which had the same high (≥3.00) indicator, were 1, 2, 4, 9,10, 11, 12, 16, and 19. All other points had average indicators (2.50–3.00). So, nine items out of 39 had a high (>3.00) average value whereas only one item out of 39 had a low (2.19) average value. High indicators mean that the value in this dimension is greater than in low indicators. In all items standard deviation was ≤1 (range 0.78–1). (See Table 8.)

Table 8. Descriptive statistics of items in the personal dimension of N-CT-4 Practice (future graduate nurses of technical and professional education)

№	Items	Mean	Std. Deviation	P-value
3	I show my feelings to others.	2.13	0.78	0.001
7	I look for alternative responses when I am faced with one that isn't satisfactory.	2.57	0.89	0,00
6	It is easy for me to understand how others feel.	2.67	0.92	0.001
13	I am aware of when I am acting in an impulsive manner.	2.79	0.93	0,00
8	I identify the time and place to evaluate my performance and make improvements.	2.84	0.94	0.019
17	My behaviour is firm.	2.87	0.93	0,00
28	I create chances for improvement and offer innovations.	2.88	0.91	0,002
18	I initiate and complete tasks on my own.	2.89	0.90	0,00
31	The greater the chance of failure in an undertaking, the likelier I am to go ahead.	2.90	0.96	0,00
23	I make decisions in an objective manner.	2.92	0.86	**0.201**
22	I accept that there is more than one way to approach life.	2.93	0.94	**0.005**
24	I accept cultural differences in people's responses to situations.	2.93	0.91	**0,00**
14	I believe in myself and in others and act accordingly.	2.95	0.91	0,00
5	I know how to put myself in the place of others to see how they feel.	2.96	0.96	0,00
36	I encourage others to follow a healthy lifestyle.	2.96	0.95	**0,00**
20	I consider myself to be meticulous in my actions.	2.96	0.97	0,00
15	I see problems as challenges to be overcome, and not as threats.	2.97	0.98	0,00
35	I see myself as having a healthy lifestyle.	2.98	0.99	0,00
34	I don't impose my own thinking on others, and I see myself as open to change.	3.0	1.00	0,00
16	I believe that I act in a firm manner.	3.01	0.93	0,00

1	I recognize my own emotions.	3.03	1.00	0,00
9	When I have information I try to interpret it before jumping to conclusions.	3.004	0.92	0,00
29	I act when I have the chance to do so.	3.05	0.85	0,00
12	I act in a reasoned, step-by-step manner.	3.06	0.88	0,00
10	Before acting I reflect upon the advantages and disadvantages of my decision.	3.07	0.90	0,00
37	I look for self-improvement in my way of thinking.	3.07	0.90	0,00
39	I promote action in the organization designed to improve safety and quality.	3.10	0.97	0,00
27	I consider the consequences before taking action.	3.13	0.88	0,00
30	I remain loyal to my values in the face of opposition from others.	3.13	0.90	0,00
32	I know how to be patient in achieving my goals.	3.14	0.90	0,00
33	I know my strengths and weaknesses.	3.16	0.93	0,00
26	I look for solutions appropriate to each situation.	3.16	0.87	0,00
33	I see myself as persistent in trying to reach my goals.	3.16	0.91	0,00
21	I consider myself to be prudent in my actions.	3.19	0.87	0,00
25	I look for real solutions to problems.	3.19	0.88	0,00
11	I think before I act.	3.25	0.86	0,00
38	I promote patient health.	3.26	0.90	0.00
4	I am faithful to my principles and values.	3.33	0.87	0,00
19	I take responsibility for my own actions.	3.47	0.83	0,00

7.3.2 Future graduate nurses of technical and professional education descriptive statistics of intellectual and cognitive dimension.

Future graduate nurses of technical and professional education the mean score of intellectual and cognitive dimension of the N- CT- 4 Practice Questionnaire was 139.6, SD = 40.8. In items of intellectual and cognitive dimension, the maximum average value was 3.50, and the minimum average value was 2.90. The highest level of average value (3.50) was in item 77 (“I am able to distinguish between situations that represent ethical conflicts and those that do not”). The lowest average value (2.90) was in item 74 (“I modify the plan of care in accordance with the patient’s state”). These items had the same high (≥3.30) indicator: 46, 47, 48, 49, 51, 52, and 77. Closer to the minimum average the average (≤3.00) were items, 40, 42, 73, and 74. All other items had average indicators (3.00-3.50). So, 7 items out of 44 had a high (≥3.30) average value, and 4 items out of 44 had a low (≤3.00) average value. The high average values in this dimension were greater than the low values. In all items, standard deviation was ≤1.01 (range 0.70–1.01) (see more detailed information in Table 9).

Table 9. Descriptive statistics of items in the intellectual and cognitive dimension of N-CT-4 Practice (future graduate nurses of technical and professional education)

№	Items	Mean	Std. deviation	p-value
74	I modify the plan of care in accordance with the patient's state.	2.90	1.01	0,018
73	I am able to predict possible patient complications and to being appropriate preventive measures.	2.97	0.94	0,00
40	I have the scientific knowledge required to carry out my professional practice.	2,98	0,93	0,001
42	I have the knowledge needed to deal with the psychosocial aspects of the patients.	3.00	0.99	0,016
75	I carry out actions designed to promote the health of patients and their families or caregivers.	3.06	1.00	0,025
70	I treat interventions and nursing actions one by one in order to prevent or control problems.	3.07	0.98	0,00
81	When I have assimilated newly learned material I try to analyse how I came to learn it.	3.07	0.96	**0,00**
71	I recognize changes inpatient health status.	3.09	0.94	0,002
72	I am able to interpret the signs and symptoms that may be indicative of complications in a patient's state.	3.10	0.91	0,005
83	I share the mission, vision, and values of my organization.	3.10	0.92	0,014
58	I decide when data outside the normal limits may be signs or symptoms of specific problems.	3.11	0.93	0,001
69	I decide upon the interventions appropriate for achieving the expected outcomes (results).	3.11	0.95	0,001
54	I use strategies designed to encourage the participation of patients and their families or caregivers in the decision-making regarding patient health.	3.12	0.95	0,002
62	I analyse the data and identify possible omissions.	3.12	0.93	0,00
79	I use evidence based information resources to support my clinical practice.	3.12	0.91	0,00
53	I choose among different alternatives, examining the consequences of each.	3.13	0.99	0,002
43	I apply knowledge derived from scientific evidence in carrying out care.	3.14	0.93	0,00
76	I try to educate patients how to prevent heath complications.	3.14	0.95	0,00
41	I have the theoretical basis in nursing methodology needed for my professional practice.	3,16	0,92	0,002
45	I fill out nursing records in a complete, rigorous manner.	3.16	0.94	0,081
61	I am able to recognize contradictions between the subjective and objective data.	3.16	0.87	0,016
44	I am able to communicate effectively.	3.17	0.92	0,00
59	I identify what information may be relevant to understanding a specific health problem.	3.19	0.89	0,00
63	When the information available is incomplete I look for whatever else is needed in order to better understand the clinical situation.	3.19	0.92	0,010
64	On the basis of the data collected I identify the current and potential problems of the patient.	3.19	0.91	0,00
65	I determine the causes and factors underlying the problems.	3.19	0.89	0,00
67	I prioritize the actions to be taken on the basis of each patient's situation.	3.19	0.92	0,00
68	I consider the patient and the family or carer to be central figures when making decisions about the management of patient health.	3.20	0.95	0,00
57	I observe which patient signs or symptoms are within normal limits, and which ones are not.	3.22	0.89	0,00
66	I identify the results that I expect to observe in the patient following the care process.	3.22	0.88	0,00
80	I understand which of my abilities will be useful in achieving what I set out to do.	3.23	0.92	0,00
82	When I need to learn something I know to proceed to learn it.	3.23	0.92	0,00
60	I compare what the patient says (subjective data) with what I observe (objective data).	3.24	0.29	0,00

56	I obtain the data that are key to determining the factors that may play a role in the care of patients.	3.24	0.90	0,00
78	I use the documented information resources in a critical manner.	3.24	0.88	0,00
50	I am able to commit myself to realizing the values of the profession.	3.26	0.91	0,00
55	I carry out systematic, careful assessment in order to collect the information needed to identify health problems.	3.28	0.91	0,00
46	I believe that the people that I look after are equal regardless of social or cultural differences.	3.31	0.92	0,00
47	I provide safe, competent, and compassionate care.	3.32	0.89	0,003
52	I try to guarantee patient and wokplace safety.	3.34	0.89	0,00
51	I take the actions needed to prevent risk to patients.	3.36	0.85	0,00
48	I carry out professional practice based on the principle of respect for the rights of the patient.	3.38	0.91	0,00
49	I respect the privacy and confidentiality of the patient.	3.48	0.82	0,002
77	I am able to distinguish between situations that represent ethical conflicts and those that do not.	3.50	0.70	0,00

7.3.3 Future graduate nurses' of technical and professional education descriptive statistics of interpersonal and self-management dimension

For the future graduate nurses of technical and professional education, the mean score of interpersonal and self-management dimension of the N- CT- 4 Practice Questionnaire was 62.7, SD = 19.02. In items of interpersonal and self-management dimension, the maximum average value was 3.22, and the minimum average value was 3.04. The highest level of average value (3.22) was in item 100 ("I carry out follow-up of the delegated tasks"). The lowest average value (3.04) was in item 88 ("I apply strategies to resolve conflicts arising from relations between the patient and family/carer, when necessary"). The lowest average value (3.31) was in item 98 ("I use critical thinking in order to propose new solutions to problems that have been identified"). Items 85, 86, 89, 94, 95, 98, 100, 101, and 103 also had a high (≥3.16) indicator. Closer to the minimum average the average (≤3.10) were items 87, 88, 90, 96, 97, and 99. All other items had average indicators (3.10–3.16). This means that 9 points out of 20 had a high (≥3.16) average value, and 6 points out of 20 had a low (≤3.10) average value. The high average values in this dimension were greater than the low values. In all items standard deviation was ≤1.01 (range 0.91–1.01). (See Table 10.)

Table 10. Descriptive statistics of items in the interpersonal and self-management dimension of N-CT-4 Practice (future graduate nurses of technical and professional education)

№	Items	Mean	Std. deviation	p-value
88	I apply strategies to resolve conflicts arising from relations between the patient and family/carer, when necessary.	3.04	1.01	0,001
97	I use strategies (establishing priorities, organizing time, organizing the workplace) in order to better manage time.	3.05	0.96	0,102
87	I use strategies designed to enhance the empowerment (increasing capacities and involvement) of the patient and family/carer in the care process.	3.07	0.97	0,005
96	I am able to optimally manage my time.	3.09	0.92	0,002
99	I delegate tasks in line with the knowledge, abilities, and skills of the people who will carry them out.	3.09	0.96	0,001
90	I use strategies designed to enhance the empowerment of the members of the professional team.	3.10	0.98	0,00
91	I use strategies designed to resolve conflicts arising from professional relations.	3.11	0.95	0,00
92	I adapt to organizational changes in my workplace.	3.11	0.91	0,00
84	I adapt information to the needs and capacities of the patient.	3.12	0.94	0,00
93	I try to assist in the adaptation of others in the work team to organizational changes in the workplace.	3.13	0.92	0,002
102	I am able to manage a professional group to achieve stated goals.	3.14	0.98	0,003
98	I use critical thinking in order to propose new solutions to problems that have been identified.	3.16	0.93	0,00
103	I am able to help contribute to a healthy working environment.	3.16	0.95	0,00
85	I offer emotional support to the patient and family/carer.	3.18	0.93	0,00
89	I defend the rights of the professional team.	3.18	0.939	0,00
95	I share my experiences with other professionals in order to achieve common goals.	3.18	0.95	0,00
86	I defend the rights of the patient and family/carer.	3.19	0.95	0,00
101	I try to have a positive influence on other members of the professional team so that they can achieve the goals that have been set.	3.19	0.94	0,00
94	I share my experiences with the nursing team in order to achieve common goals.	3.20	0.91	0,00
100	I carry out follow-up of the delegated tasks.	3.22	0.95	0,00

7.3.4 Future graduate nurses of technical and professional education descriptive statistics of technical dimension

For the future graduate nurses of technical and professional education, the mean score of technical dimension of the N- CT- 4 Practice Questionnaire was 18.5, SD = 2.1. In items of technical dimension, the maximum average value was 3.33, and the minimum average value was 3.03. The highest level of average value (3.33) was in item 108 (“I administer medication in a safe manner (dose, preparation, and handling of instruments to administer the medication)”). The lowest average value (3.03) was in item 105 (“I possess skills in the use of information and communication technologies needed to produce optimal professional results”). Items 108 and 109

had the same high (≥3.24) index. Two items, 105 and 106, were in the average level (3.03 and 3.08). In all items, standard deviation was ≤1 (range 0.89–1). (See Table 11.)

Table 11. Descriptive statistics of items in the technical dimension of N-CT-4 Practice (future graduate nurses of technical and professional education)

№	Items	Mean	Std. deviation	p-value
104	In the event of clinical uncertainty I know how to obtain reliable information from the scientific databases.	2.93	1.00	0,001
105	I possess skills in the use of information and communication technologies needed to produce optimal professional results.	3.03	0.96	0,00
106	I am able to carry out needed techniques and procedures, relevant to the complexity of each case.	3.08	0.94	0,00
107	I match the procedure to be done with the appropriate context for carrying it out.	3.21	0.90	0,00
109	I carry out the care associated with administering medication (assessing the therapeutic response, previous and subsequent monitoring) in the correct manner.	3.24	0.97	0,00
108	I administer medication in a safe manner (dose, preparation, and handling of instruments to administer the medication).	3.33	0.89	0,00

As for the results of the overall average score for each dimension of the questionnaire for future graduate nurses of technical and professional education showed the following indicators on average: in the personal (88.42) and intellectual and cognitive dimensions (139.6), interpersonal and self-management (62.7), and technical (18.5). Consequently, the average score of critical thinking skills in future graduate nurses of technical and professional education in four dimensions was 309 and SD = 92.1. The range of total points ranges from 109 to 436. Thus, critical thinking skills are at a low level for future graduate nurses of technical and professional education (309).

7.4 Comparison of the level of critical thinking of nursing students

The comparison of the level of critical thinking between the graduates of applied bachelors in nursing and future graduate nurses of technical and professional education was made using the U-Mann-Whitney test. The results are presented in Appendix 5.

Almost all items, except seven, had significant difference between the applied bachelor graduates and the future graduates of technical and professional education by mean value. There was no statistically significant difference between the mean scores of the applied bachelor graduates and the future graduates of technical and professional education with the following items: for personal dimensions 2 (“I know my strengths and weaknesses”) (p = 0.064) and 3 (“I show my feelings to others”) (p = 0.058); for intellectual and cognitive dimensions 54 (”I use strategies designed to encourage the participation of patients and their families or caregivers in the decision-making regarding patient health”) (p = 0.011), 65 (“I determine the causes and factors underlying the problems”) (p = 0.018), 78 (”I use the documented information resources in a critical manner”) (p = 0.031), and 79 (“I use evidence based information resources to support my clinical practice”) (p = 0.011); and for interpersonal and self-management dimension 98 (“I use critical thinking in order to propose new solutions to problems that have been identified”) (p = 0.105).

Concerning the dimensions of the questionnaire, graduate nurses of applied bachelors showed a high indicator for the average value for the intellectual and cognitive (154.1) and technical (21.2) dimension than other dimensions. Consequently, the mean score of critical thinking skills of graduate students of applied bachelor of nursing in four dimensions was 345 and SD = 73,8. The range of total scores ranged from 109–436. Thus, graduate students of applied bachelor of nursing critical thinking skills is at moderate level (345).

Future graduate nurses of technical and professional education showed a high indicator for the average value for the intellectual and cognitive (139.6) and interpersonal and self-management (62.7) dimensions whereas personal dimension mean was lowest (88.42). Consequently, the mean score of critical thinking skills of graduate students of applied bachelor of nursing in 4 dimensions was 309 and SD = 92.1. Thus, future graduate nurses of technical and professional education critical thinking was at a low level (309). (See Table 12.)

Table 12. Sum scores for each dimensions of N-CT-4 Practice

Dimensions	**Graduate nurses of applied bachelors**	**Future graduate nurses of technical and professional education**
Personal	100.5	88.42
Intellectual and cognitive	154.1	139.6

Interpersonal and self-management	69.3	62.7
Technical	21.2	18.5
Total	**345**	**309**

8 Discussion

The degree of critical thinking of nursing students was determined in accordance with the objectives of this research work. First of all, it was determined that the degree of critical thinking in students of the graduates of applied bachelors in nursing was of the moderate degree (345). Secondly, it was found that the level of critical thinking among future graduate nurses of technical and professional education is low (309). Thus, the answer to the research question "What is the level of critical thinking among nursing students at different levels of education?" was received, and the hypothesis of this study, that applied bachelors have a higher level of critical thinking than traditional nurses, was confirmed. Therefore, it can be noted that the results of this study are the same with previous studies, where clinical nurses had a moderate level of critical thinking (Zuriguel Pérez et al 2019; Zuriguel Pérez, Lluch Canut, Agustino Rodríguez, Gómez Martín, Roldán Merino & Falcó pegueroles 2018). The level of critical thinking is low in nursing students who do not yet have a diploma or work experience, and it is assumed that increasing knowledge of the nursing profession, internships from early courses, increasing the prevalence of the disease, work experience, and continuing education can be effective. (Ozcan, & Elkoca 2019). However, according to Yurdanur's (2016) study conducted in Turkey, the level of critical thinking of clinical nurses who work in the intensive care unit was low, and it was claimed that the experience and level of education of nurses did not affect their level of critical thinking.

Graduates of applied bachelors in nursing had the highest level in the intellectual and cognitive dimension. The high level of this dimension positively affects the work of nurses in the clinic. According to Wangensteen, Johansson, Björkström and Nordström (2010), intellectual curiosity is important in the professional field, where the knowledge base is constantly expanding. They suggest that supervision by experienced nurses can increase intellectual integrity can help increase the propensity of newly admitted nurses to think critically.

There is also a study that noted the attitude of students to the nursing profession, and that the increase in educational years increases their ability to take a critical approach to any opinion, including their own. (Ozcan & Elkoca 2019). In addition, it has been suggested that the low level of critical thinking in traditional nurses may be related to the questionnaire used in this study, as it is intended for clinical nurses. There is evidence that the N-CT-4 Practice can be used to measure critical thinking in nursing practice (Zuriguel Pérez et al. 2017).

Surprisingly, future nursing graduates of technical and professional education showed the lowest level of personal dimension of all dimensions. According to Zuriguel Pérez and colleagues (2017), personal dimension explores individual patterns of intellectual behavior such as attitudes, beliefs, and values, and they are seen as a key element that increases the ability to think. Therefore, it is necessary to work more with nursing students of technical and professional education using these dimensions.

It was expected that future nursing graduates of technical and professional education would have a lower technical dimension than the other questionnaire dimensions. According to Zuriguel Pérez and colleagues (2017), the technical component is the implementation of technical procedures related to the professional activity of a nurse. Students who do not have professional experience in performing procedures, on the contrary, showed a high rate in this dimension.

As for the graduate nurses of the applied bachelor's degree, they showed a higher average value for intellectual and cognitive and technical dimensions than other dimensions. This means that they are well able to perform their professional skills in a clinical environment and know their actions and understand those related to the nursing process and decision making.

Based on the results of this study, subsequent studies should focus on factors that increase critical thinking in student nurses with technical and professional education. Further research should be conducted to determine the level of critical thinking in nursing students of technical and professional education by a suitable questionnaire for students. In addition, it is necessary to conduct research aimed at determining the level of critical thinking of students of an academic nursing degree. Furthermore,

research should be conducted among clinical nurses to determine the level of critical thinking among nurses who have an applied bachelor's degree and have not received an applied bachelor's degree. This research will help demonstrate how the applied baccalaureate curriculum affects the critical thinking of nurses.

9 Recommendations

Based on the data obtained, the following recommendations have been developed:

1. Use of teaching methods to improve critical thinking

2. Application of tests that determine the critical thinking level of nursing students

3. Employers are encouraged to take a comprehensive approach to the critical thinking of graduate nurses, since the critical thinking of nurses affects their work in the clinic and helps to achieve positive results in patient care.

4. Training of nurse teachers in special courses on methods of increasing critical thinking

10 Conclusions

In the course of this study, most importantly, it was determined that the level of critical thinking of the applied bachelors of nursing reached the mid-level and the critical thinking of nursing students of technical and professional education was low. The findings are important in order to determine which groups have a high level of critical thinking among nursing students and to know which groups should improve their critical thinking. Accordingly, applied bachelors in nursing have a higher level of critical thinking than nursing students of technical and professional education.

It is necessary to increase the critical thinking of nursing students of technical and professional education, for which the above recommendations can be used. Taking into account that critical thinking develops in the process of training and practice, nursing students of technical and professional education should combine practical training along with theoretical training. Also, the positions of the applied baccalaureate need to improve and consolidate their critical thinking, developing their clinical experience with a penchant for continuous learning and evidence-based

practice. In addition, the research can help in the development of effective strategies, projects for the development of critical thinking for students of colleges of nursing as well as among medical professionals of the clinic.

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Appendices

Appendix 1. Letter to medical college managers.

Dear manager

I invite your students of the graduate course of the applied nursing and technical and profeccional education to participate in my study, the purpose of which is to study the critical thinking of students of graduates of applied undergraduate bachelor's degree and technical and profeccional training of nursing, also give recommendations based on the results of teachers of medical colleges of Kazakhstan. With the help of the questionnaire, we want to get information about the skills of critical thinking of students. The questionnaire is filled in an electronic format, where students answer each question individually. At the same time, participation is voluntary, all data is collected anonymously. According to the results of the study, a master's thesis and prepared articles in international scientific journals are prepared. The studies will be appropriately removed after the research is completed. I ask for your consent to perform anchketing with your students.

Sincerely,

Babazhanova Ugilzhan, Master Degree

e-mail:

Tel:

Supervisors:

Candidate of Medical Sciences Ospanova D, university of KazMUCE.
Tel:

PhD Johanna Heikkilä, Senior Advisor
JAMK University of Applied Sciences
Tel:

Appendix 2. Letter for students to nursing graduates.

Dear student,

I invite you to participate in a study called: The critical thinking skills of nursing students. I am currently enrolled in the Kazakh-Finnish master's degree in nursing at JAMK University in Finland and KazMUCE in Kazakhstan, and I am in the process of writing my (i.e. master's) thesis. The purpose of the study is to investigate the critical thinking of applied undergraduate and traditional nursing students at the graduate level of education, also to give recommendations based on the results to teachers of medical colleges in Kazakhstan . Your participation in this research project is entirely voluntary. You can opt out altogether you don't want to answer. There are no known risks to participation. Your answers will remain anonymous. Data from this study will only be reported as a cumulative total. No one but the researcher will know your individual answers to this questionnaire. The results of the research will be described in the master's thesis and in an article that will be published in international scientific journals. If you agree to participate in this project, please answer the electronic questionnaire as best you can. It should take approximately 20-25 minutes to finish. If you choose "continue", this will be considered as informed consent.

If you have any questions about this project, feel free to contact:

Babazhanova Ugilzhan, Master Degree

e-mail:

Tel:

Supervisors:

Candidate of Medical Sciences Ospanova D, university of KazMUCE.
Tel:

PhD Johanna Heikkilä, Senior Advisor
JAMK University of Applied Sciences
Tel:

Thank you for your help in this endeavor

Appendix 3. Student`s survey

Please answer all of the following questions as they describe you.

1. Gender:

Female

Male

2. Age _____ years

3. Name of college?

Higher medical College "of the city akimat, Nur-Sultan»

Kokshetau higher medical College;

Pavlodar higher medical College;

West Kazakhstan higher medical college.

Turkestan higher medical College

Higher multidisciplinary medical College "Turkestan»

Aktobe Higher medical College named after hero of the Soviet Union Manshuk Mametova

Other_____

4. Your degree of education

applied bachelor of nursing

technical and professional education nurses

5. Did you pass certification exam?

Yes

No

Not at all/student

6. Years working as nurse

no experience/student

less than one year

from 1 to 5 years

from 5 to 10 years

from 10 to 15 years

from 15 to 20 years

more than 20

7. Working unit:

Hospital

clinic

dispensary

ambulatory

outpatient department

ambulance station

8. Do you work in a position of?

General nurse

Head nurse

Senior nurse

Applied bachelor

Not at all/student

Other_____

9. Shift work

Day (8 h)-Full time

Night (16 h)-Full time

Mixed

Part time

Not at all/student

Other_____

10. Experience in current unit

no experience/student

less than one year

from 1 to 5 years

from 5 to 10 years

from 10 to 15 years

from 15 to 20 years

more than 20

Appendix 4. Comparison of two groups using the Mann-Whitney criteria.

№	Items	Mann-Whitney U	P
	PERSONAL DIMENSION		
1.	I recognize my own emotions.	20874	0,001
2.	I know my strengths and weaknesses.	22855,5	0,064
3.	I show my feelings to others.	22801,5	0,058
4.	I am faithful to my principles and values.	18917	0,000
5.	I know how to put myself in the place of others to see how they feel.	19124,5	0,000
6.	It is easy for me to understand how others feel.	18169	0,000
7.	I look for alternative responses when I am faced with one that isn't satisfactory.	19677	0,000
8.	I identify the time and place to evaluate my performance and make improvements.	17709	0,000
9.	When I have information I try to interpret it before jumping to conclusions.	18308,5	0,000
10.	Before acting I reflect upon the advantages and disadvantages of my decision.	19018	0,000
11.	I think before I act.	20027	0,000
12.	I act in a reasoned, step-by-step manner.	19291	0,000
13.	I am aware of when I am acting in an impulsive manner.	20468,5	0,000
14.	I believe in myself and in others and act accordingly.	17421,5	0,000
15.	I see problems as challenges to be overcome, and not as threats.	18672	0,000
16.	I believe that I act in a firm manner.	17779	0,000
17.	My behaviour is firm.	15620	0,000
18.	I initiate and complete tasks on my own.	16752	0,000
19.	I take responsibility for my own actions.	20432	0,000
20.	I consider myself to be meticulous in my actions.	18588	0,000
21.	I consider myself to be prudent in my actions.	19270	0,000
22.	I accept that there is more than one way to approach life.	21210	0,000
23.	I make decisions in an objective manner.	17486	0,002
24.	I accept cultural differences in people's responses to situations.	19268,5	0,000
25.	I look for real solutions to problems.	19577	0,000
26.	I look for solutions appropriate to each situation.	19976,5	0,000
27.	I consider the consequences before taking action.	19619	0,000
28.	I create chances for improvement and offer innovations.	19146,5	0,000
29.	I act when I have the chance to do so.	19003	0,000
30.	I remain loyal to my values in the face of opposition from others.	17566	0,000
31.	The greater the chance of failure in an undertaking, the likelier I am to go ahead.	19265	0,000
32.	I know how to be patient in achieving my goals.	17680	0,000
33.	I see myself as persistent in trying to reach my goals.	18471,5	0,000
34.	I don't impose my own thinking on others, and I see myself as open to change.	20614,5	0,000
35.	I see myself as having a healthy lifestyle.	185828	0,000
36.	I encourage others to follow a healthy lifestyle.	17235	0,000
37.	I look for self-improvement in my way of thinking.	19278,5	0,000
38.	I promote patient health.	17174,5	0,000
39.	I promote action in the organization designed to improve safety and quality.	18442	0,000
	INTELLECTUAL AND COGNITIVE DIMENSION		0,000
40.	I have the scientific knowledge required to carry out my professional practice.	19334,5	0,000
41.	I have the theoretical basis in nursing methodology needed for my professional practice.	18483,5	0,000
42.	I have the knowledge needed to deal with the psychosocial aspects of the patients.	19326	0,000
43.	I apply knowledge derived from scientific evidence in carrying out care.	20688,5	0,000
44.	I am able to communicate effectively.	19086,5	0,000
45.	I fill out nursing records in a complete, rigorous manner.	17714	0,000
46.	I believe that the people that I look after are equal regardless of social or cultural differences.	19945	0,000
47.	I provide safe, competent, and compassionate care.	19914	0,000

48.	I carry out professional practice based on the principle of respect for the rights of the patient.	21396,5	0,001
49.	I respect the privacy and confidentiality of the patient.	21497	0,001
50.	I am able to commit myself to realizing the values of the profession.	19365,5	0,000
51.	I take the actions needed to prevent risk to patients.	19288	0,000
52.	I try to guarantee patient and workplace safety.	19405,5	0,000
53.	I choose among different alternatives, examining the consequences of each.	20498,5	0,000
54.	I use strategies designed to encourage the participation of patients and their families or caregivers in the decision-making regarding patient health.	21952	0,011
55.	I carry out systematic, careful assessment in order to collect the information needed to identify health problems.	22573	0,033
56.	I obtain the data that are key to determining the factors that may play a role in the care of patients.	21634	0,004
57.	I observe which patient signs or symptoms are within normal limits, and which ones are not.	21671,5	0,005
58.	I decide when data outside the normal limits may be signs or symptoms of specific problems.	21478,5	0,004
59.	I identify what information may be relevant to understanding a specific health problem.	21775	0,006
60.	I compare what the patient says (subjective data) with what I observe (objective data).	20170,5	0,000
61.	I am able to recognize contradictions between the subjective and objective data.	21145,5	0,001
62.	I analyse the data and identify possible omissions.	19683	0,000
63.	When the information available is incomplete I look for whatever else is needed in order to better understand the clinical situation.	20265	0,000
64.	On the basis of the data collected I identify the current and potential problems of the patient.	21255	0,002
65.	I determine the causes and factors underlying the problems.	22196	0,018
66.	I identify the results that I expect to observe in the patient following the care process.	20018,5	0,000
67.	I prioritize the actions to be taken on the basis of each patient's situation.	18202,5	0,000
68.	I consider the patient and the family or carer to be central figures when making decisions about the management of patient health.	20770,5	0,000
69.	I decide upon the interventions appropriate for achieving the expected outcomes (results).	20231,0	0,000
70.	I treat interventions and nursing actions one by one in order to prevent or control problems.	18779,5	0,000
71.	I recognize changes inpatient health status.	19674	0,000
72.	I am able to interpret the signs and symptoms that may be indicative of complications in a patient's state.	19415,5	0,000
73.	I am able to predict possible patient complications and to being appropriate preventive measures.	17800,5	0,000
74.	I modify the plan of care in accordance with the patient's state.	21176	0,002
75.	I carry out actions designed to promote the health of patients and their families or caregivers.	21598	0,005
76.	I try to educate patients how to prevent heath complications.	18939	0,000
77.	I am able to distinguish between situations that represent ethical conflicts and those that do not.	19812	0,000
78.	I use the documented information resources in a critical manner.	22403	0,031
79.	I use evidence based information resources to support my clinical practice.	21956	0,011
80.	I understand which of my abilities will be useful in achieving what I set out to do.	21859	0,007
81.	When I have assimilated newly learned material I try to analyse how I came to learn it.	19155,5	0,000
82.	When I need to learn something I know to proceed to learn it.	20194	0,000
83.	I share the mission, vision, and values of my organization.	18768,5	0,000
	INTERPERSONAL AND SELF-MANAGEMENT DIMENSION		
84.	I adapt information to the needs and capacities of the patient.	21099	0,001
85.	I offer emotional support to the patient and family/carer.	20840,5	0,000
86.	I defend the rights of the patient and family/carer.	21331,5	0,002

87.	I use strategies designed to enhance the empowerment (increasing capacities and involvement) of the patient and family/carer in the care process.	21033,5	0,001
88.	I apply strategies to resolve conflicts arising from relations between the patient and family/carer, when necessary.	21111,5	0,001
89.	I defend the rights of the professional team.	20680	0,000
90.	I use strategies designed to enhance the empowerment of the members of the professional team.	20428	0,000
91.	I use strategies designed to resolve conflicts arising from professional relations.	21499	0,004
92.	I adapt to organizational changes in my workplace.	18882	0,000
93.	I try to assist in the adaptation of others in the work team to organizational changes in the workplace.	19543	0,000
94.	I share my experiences with the nursing team in order to achieve common goals.	19344,5	0,000
95.	I share my experiences with other professionals in order to achieve common goals.	19547,5	0,000
96.	I am able to optimally manage my time.	18314,5	0,000
97.	I use strategies (establishing priorities, organizing time, organizing the workplace) in order to better manage time.	19939	0,000
98.	I use critical thinking in order to propose new solutions to problems that have been identified.	23122,5	0,105
99.	I delegate tasks in line with the knowledge, abilities, and skills of the people who will carry them out.	21402	0,003
100.	I carry out follow-up of the delegated tasks.	19031	0,000
101.	I try to have a positive influence on other members of the professional team so that they can achieve the goals that have been set.	20631	0,000
102.	I am able to manage a professional group to achieve stated goals.	20905	0,001
103.	I am able to help contribute to a healthy working environment.	19037	0,000
	TECHNICAL DIMENSION		
104.	In the event of clinical uncertainty I know how to obtain reliable information from the scientific databases.	20232	0,000
105.	I possess skills in the use of information and communication technologies needed to produce optimal professional results.	19364,5	0,000
106.	I am able to carry out needed techniques and procedures, relevant to the complexity of each case.	19165	0,000
107.	I match the procedure to be done with the appropriate context for carrying it out.	18709	0,000
108.	I administer medication in a safe manner (dose, preparation, and handling of instruments to administer the medication).	18761	0,000
109.	I carry out the care associated with administering medication (assessing the therapeutic response, previous and subsequent monitoring) in the correct manner.	18675	0,000