

## Conference Paper

# Enhancing Critical Thinking Skills in Nursing Higher Education in Preparation for the Industrial Revolution 4.0

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Nursing higher education will challenge the dynamics of the work environment in the Industrial Revolution Era 4.0 and they will compete with digital technology. Critical thinking skills as one of the basic competencies must support higher education in preparation for the industrial revolution 4.0. Exploring thinking skills makes nursing students will be trained in their punishment and analysis skills according to their knowledge. Critical thinking skills not only guide students to develop continuing skills, but also help nursing students to be motivated to create innovation in college. The aims of this review is to learn the critical skills needed in higher education to prepare for the industrial revolution 4.0 based on literature understanding. There are 6 (six) important things about Critical Thinking in nursing education in the Industrial Revolution Era 4.0, namely Definition of Critical Thinking, Why do we need to focus on critical thinking in higher education, Why is critical thinking needed in industry 4.0 preparation, Industry Innovation 4.0 and human potential to overcome environmental problems, Critical Thinking in Nursing Education, and Educational Strategies for Developing Critical Thinking in Nursing. These critical thinking skills are suitable for equipping students in higher education before they enter different workplaces. Educational strategies in developing critical thinking skills by supporting the use of questions, small group activities, role plays, debates, use of case studies, journals, simulations, puzzles, problem solving and writing assignments. Nursing students who think critically in line with creative thinking and innovation will be useful to survive in the dynamics of the industrial revolution 4.0 and beyond in the world of the future.

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Published: 15 March 2021

Publishing services provided by  
Knowledge E

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Selection and Peer-review under the responsibility of the IVCN Conference Committee.

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## 1. Introduction

Changes in the world are now entering the era of the industrial revolution 4.0 or the fourth world industrial revolution where information technology has become the basis in human life (1). The industrial revolution can be understood as a market for human collaboration with intelligent systems based on the internet of thinking (IoT)

or cyber physical systems, with the ability to utilize smart machines more efficiently with a synergistic environment (1). Preparing graduates who are qualified and able to compete globally, and mastering technological development is important for everyone and important for the future of a country (2). Industry 4.0 Revolution indirectly indeed demands the education world to improve. With the characteristics of the world of work in this era, of course, an effect on changing the types of jobs available. There is a lot of work that has disappeared because it's no longer needed. The change in the type of work naturally leads to new skills that must be possessed by university graduates. The industrial Revolution 4.0 requires students to have certain competencies and critical thinking skills (3). According to the World Economic Forum (2015) presentation in 2020 there are ten types of competencies that are relevant to the era of the industrial revolution 4.0, namely: (1) complex problem solving, (2) Coordinating with others, (3) people management, (4) critical thinking, (5) negotiation, (6) quality control, (7) service orientation, (8) judgment and decision making, (9) active learning, and (10) creativity. Levin (2012) states that skills in the Industrial Revolution Era 4.0 are critical thinking and problem solving, communication, collaboration, and creativity and innovation - better known as 4C Skills.

Critical thinking skills are the basic competencies that direct students to hone the skills of analysis and reasoning skills which further help students in higher education practice problem solving, creative thinking skills, and even motivate them to become more innovative (4). Competence in critical thinking is one of the hopes of nursing education. This is part of professionalism and is included in the undergraduate nursing school curriculum and is part of the criteria for accreditation and assessment of undergraduate and postgraduate nursing education programs. Determining the level of critical thinking of students in undergraduate nursing schools is important in terms of planning interventions in this field and determining the educational methods that should be used (5). Soon after this, health service accreditation agents around the world moved to include critical thinking as a requirement for nurses when making clinical judgments about the provision of care (5).

Unfortunately, not all tertiary education realizes the importance of teaching critical thinking skills that students need before entering the workplace. Undeniably, increasing human resource competence is the key to success in facing the industrial revolution 4.0.

Increased critical thinking skills can be taught through daily assignments, assignments, and class activities in higher education. By increasing students' critical thinking in higher education, students will be ready to take over in the decision making process in

the fourth industrial revolution. Advantages of critical thinking; people who are critical thinkers think freely and independently, people don't behave without thinking, and individuals can express problems explicitly (Birgili, 2015).

Although there are many digital technologies of artificial intelligence and cyber physical systems used in industry 4.0, competency in critical thinking cannot be replaced because organizations need the potential and human resources to analyze the efficiency and effectiveness of the digital technology used, system evaluation in Indonesia to solve environmental problems globally in many aspects such as economic, social, political, and cultural (6).

Nursing is a profession where knowledge and practice do not remain static but are always changing. It can be said that nurse education must enable students to become effective lifelong learners equipped with the learning skills needed for their profession. This can be achieved in different ways such as by nurse educators knowing their students' learning style preferences and applying this knowledge in the selection and utilization of teaching, learning and assessment strategies to enable them to develop outside the comfort zone of their learning styles and become more flexible in the learning span them (7).

The main objective of this review is to improve the critical thinking skills needed in nursing higher education to prepare for the industrial revolution 4.0 based on literature review. This review will explore the definition of critical thinking as well as the characteristics and components that motivate students to increase their capacity in problem solving, decision making, and even building a culture of creativity and innovation among students in Nursing Education. Finally, nursing students in tertiary institutions are expected to apply these critical thinking skills in education as well as in the future workplace.

## 2. Definition of Critical Thinking

Thinking, thought processes, and critical thinking have their basic theories with Socrates, the Greek philosopher. Much of the initial work of critical thinking defines critical thinking focused on defining concepts (8). Critical thinking defines an approach that is curious, systematic, wise, analytical, seeking truth, being mined openly, and confident in reasoning. Critical thinking skills are concluded into analysis, interpretation, self-regulation, conclusions, explanations, and evaluations (8). Critical thinking is also a process that uses various approaches to solve identified problems and requires reflective thinking and the ability to utilize logical problem solving (8). Critical thinking is a form

of higher level thinking skills based on criteria that facilitate assessment and decision making by considering the characteristics of the context (9). Critical thinking can be defined as clear and rational thinking, which consists of clarification, simplification, and organization. Specifically, clear thinking is the ability to think precisely, systematically and structurally, which can help avoid linguistic traps and hence, construct logical arguments. Rational thinking includes scientific reasoning, strategic thinking and logic that allows students to predict, explain and influence empirical phenomena. This allows one to verify whether the premise of the argument is true, relevant, and acceptable before evaluating the power of reasoning (10).

Although the definition of critical thinking varies, the components of critical thinking are identified as components (i) gathering and seeking information, (ii) questioning and investigating, (iii) analysis, evaluation, and conclusion, and (iv) problem solving and application of theory (9). These processes can give students the chance to be successful (11).

The concept of critical thinking is explained in seven characteristics namely; curiosity, open mindedness, systematicity, analytics, the search for truth, confidence in critical thinking, and maturity. This description shows that the influence of disposition on thought has many aspects. First, interest or pleasure in thinking is a prerequisite for active involvement in thinking (curiosity, the need for cognition). Second, openness underlies the willingness to consider various points of view and choices before coming to conclusions (open mindedness, flexibility). Third, a careful approach to thinking will certainly contribute to effective decision making and problem solving (conscientiousness, systematicity). Finally, values such as upholding justice and truth trigger an effort for sound and unbiased judgment (seeking truth, fair thinking). These four dimensions of thinking disposition emphasize different aspects of individual responses to situations that require thinking (12).

Critical thinking is an important skill in caring for, teaching and introducing nursing students to critical thinking is needed and must begin early, when skills develop through experience and practice (13). Three abilities in critical thinking are analysis, evaluation and conclusion (14). Therefore, in addition to finding information, students must also learn the ability to examine information and context, consider all aspects, understand and differentiate data, and link information together to synthesize the right decision or solve a problem. Finally, students are also considered critical thinkers when they are able to practice knowledge / theory, consider larger images, understand thinking processes, be reflective and sensitive, predict future situations and know what to do next (15).

### 3. Why do we need to focus on critical thinking in higher education?

Investment in higher education will produce a professional workforce, increase technical leadership for the nation, and ensure competitiveness for the nation in the Industrial Revolution Era 4.0. In the Industrial Revolution Era 4.0 increasing need for patient-centered care and addressing patient satisfaction in care and staff shifting problems, the health care environment is becoming more complex and demanding to be more competent and demand higher performance (16). However, it can also be a problem if the younger generation is not equipped with the right skills from the workforce in general. Halpern (as quoted in (17)) defines critical thinking in relation to the current challenges in education that is to prepare high-quality people who can meet the demands of the market workforce. In addition, UNESCO emphasized that one of the important tasks of higher education is to promote critical thinking and active citizenship to contribute to sustainable development, peace and prosperity (18).

(19) states that all tertiary education graduates regardless of their field of study must develop and demonstrate the capacity to think critically, solve problems, choose and handle information, possess qualities such as curiosity and intellectual rigor, creativity and imagination, and ethical values such as integrity and tolerance. By increasing this competency, higher education students will be ready to compete in the labor market in harmony with the workforce profile needed in the 4.0 industrial revolution.

### 4. Why is critical thinking needed in industry 4.0 preparation?

The industrial revolution 4.0 will lead to dynamic work, international and interdisciplinary environments, therefore competencies such as working in an interdisciplinary environment, flexibility, adaptability and innovation, creativity, critical thinking, and change management gain new interests (12). High-income countries will invest in the quality of their higher education because they understand the importance of shaping economic-driven innovation that requires high-level workforce competency. The ability to think critically is very important because compared to past work modern work requires more thinking and problem-solving skills (20). Critical thinking skills are important for nurses, like other health doctors, need to effectively manage complex care situations in a fast-paced environment that demands increased accountability (21). The process of clinical decision making and problem solving requires advanced CT (22). CT is also important

for doctors to criticize and apply evidence, especially in situations where uncertainty regarding 'best practice' is still unclear (21)

## 5. Industry Innovation 4.0 and human potential to overcome environmental problems.

The Industrial Revolution 4.0 identifies and groups competencies under three headings; basic literacy, character quality, and human competence that includes critical thinking or problem solving (2). Critical thinking is concluded as one of the important competencies to help participants to integrate cultural sensitivity and relevance, problem-based learning, and technological progress with real-world applications. (13) stated that higher education graduates must demonstrate the attributes of critical thinkers, such as having an open mind, actively pursuing truth, showing patience and self-confidence, engaging in self-reflection, showing courage to admit and correct mistakes, show neutral perspective, have sharp observation skills, accept criticism, display good communication skills, and accurately document findings and actions. The attributes of these critical thinkers improve the skills of employees to solve problems in the workplace, consider the holistic aspects of making decisions beforehand, and stimulate their creativity to create innovation for the benefit of the organization.

Critical thinking has 11 affective components and 7 CT cognitive skills (such as open mindedness, flexibility, self-reflective, information seeking and analyzing), CT can improve patient outcomes through enabling nurses to do more evidence-based practice than guessing facts (23). Nursing managers also need CT to increase the efficiency of the professional practice environment (24). This shows that managers who are good critical thinkers in turn have the ability to develop a positive work environment increasing nurse staff retention, job satisfaction and employee performance. The health care system environment has also been moved from a process oriented system (eg dependent and provider-dominated procedures) to a results-based and evidence-driven system that can be influenced by exogenous factors (12).

## 6. Critical Thinking in Nursing Education

Developing critical thinking skills in nursing is essential in building a scientific foundation for the profession, for creating disciplines where truth is sought and implemented, and where the use of theoretical perspectives is increasingly being tested and used. The power of critical thinking allows nurses to logically assess their own experience and

training and apply the results of this evaluation to patient care. The ability of nurses to overcome problems, their skills in determining patient needs and providing systematic care all depend on their critical thinking skills (17).

One of the goals of nursing education is to produce nurses with the ability to think critically and thus be able to provide safe nursing care. Nurses today are expected to use critical thinking skills to make judgments about a patient's situation and act on those assessments every day. Nurses must consider a lot of evidence and make quick decisions. Critical thinking has long been considered an important part of nursing (8). Nursing graduates must have critical thinking skills in addition to basic nursing and science knowledge to make the necessary clinical judgment (5). The development of these skills requires a different teaching and learning strategy. Critical thinking dispositions (CTD) and learning styles (LS) of student nurses are of primary concern to nurse educators because they influence the teaching methods used in their development (24).

Higher education has supported a student-centered approach and emphasized that students must know their own learning styles. For learning assignments, effective strategies are to guide and enable students to become effective learners to understand their own learning styles and to manage their own learning. Learning styles can be described as the way students begin to concentrate on, process, internalize, and remember new and difficult academic information (8). Learning styles can also be defined as dominant / not dominant. Where the dominant learning style is defined as, the learning style score is included in the strong or very strong category (4). Student learning styles are a major consideration in planning for effective and efficient learning. If more attention is given to different individual learning styles, students will learn more effectively. Therefore, teachers must be aware of students (3). Indeed the ability to utilize several learning styles is recommended because it allows individuals to be effective, flexible, many students and professionals can take advantage of various learning opportunities that utilize any combination of learning styles needed by the learning situation. It is generally recognized that learning styles show the way of learning that someone likes or how individuals obtain information (3).

In nursing, delivery and rapidly changing health care practices require critical thinking and decision-making skills. It is important to give students the skills to search, analyze and use information effectively. Student learning styles are a major consideration in planning for effective and efficient learning (24). Critical thinking is considered a key component of nursing practice, education and knowledge (25). (25)found learning styles that nursing students liked in their studies both in their first and last year were reflectors.

(25) suggest further research is needed to determine the influence of these factors and also how reflective our findings are on student learning experiences before entering the program. Recognizing that students have different learning styles, and understanding different styles, encourages lecturers to reflect on the effectiveness of the lecture method and encourages academics to consider adopting different teaching approaches to accommodate different learning preferences as a means to enhance student learning. Before students graduate, nursing students must demonstrate mastery of skills and dispositions related to critical thinking, both in the classroom and clinical settings (8).

Competence in critical thinking is one of the hopes of nursing education. This is part of professionalism and is included in the undergraduate nursing school curriculum and is part of the criteria for accreditation and assessment of undergraduate and postgraduate nursing education programs. Determining the level of critical thinking of students in undergraduate nursing schools is important in terms of planning interventions in this field and determining the educational methods that should be used (17). Soon after this, health service accreditation agents around the world moved to include critical thinking as a requirement for nurses when making clinical judgments about the provision of care (5). Furthermore, the nursing curriculum is largely theory based. To help nursing students to apply theory has always been a challenge for nursing educators. Therefore (25) emphasize that one of the main goals of nursing education must be to help students develop critical thinking skills through experience, inquiry, and reasoning.

## 7. Educational Strategies for Developing Critical Thinking in Nursing

Educational strategies to develop critical thinking in nursing must not only be given to students but lecturers must also be supported, as they are also 'Students' in critical thinking and "undeniably the importance of setting the stage for critical thinking." "Nursing practice requires creative solutions and personalized for unexpected client circumstances. This can not be taught by rote. Critical thinking is not developed through one lecture, nor is it a clinical experience, on the contrary, thinking skills develop over time through various experiences. Critical thinking then becomes a daily experience, not a saved experience for clinical practice settings.

The nursing literature presents various techniques for developing critical thinking. Nurse educators face many challenges when teaching critical thinking. Therefore, success in teaching critical thinking requires strategic creativity. Strategies to encourage

critical thinking processes such as: formal / informal writing assignments or brief case studies; questions involving reasoning skills and the ability to organize and articulate knowledge; and finally; dialogue about complex problems (19).

Problem-based learning (PBL) has been introduced into the curriculum of a number of nursing and medical education schools as a method of promoting the development of critical thinking skills, knowledge acquisition and understanding, deductive reasoning, independent learning, interpersonal skills and clinical problem solving skills. Evaluations of PBL programs are generally positive, with reports of higher critical levels of thinking ability, independent learning and problem solving skills, decision making skills, communication skills, reflection and motivation to continue learning. More often, in the last decade nursing education throughout the world has integrated this strategy in higher education and critical thinking as a result of education. To date, three systematic reviews indicate that evidence of problem-based learning (PBL) on critical thinking skills of nursing students remains (17).

In addition to PBL, research (19) support that concept mapping is another effective strategy to promote the development of critical thinking. Many findings suggest that concept mapping can be used as an effective tool in enhancing critical thinking

Reflective writing is considered as the best practice strategy which according to scholars is effective in developing dimensions of critical thinking. Students journalizing or writing narratives with appropriate guidelines and questions are shown to have a positive influence on CT skills. Mun (2010) suggests that as writing narratives can enable educators to understand students' difficulties and thinking, the approach helps them to identify students' CT contexts and develop appropriate strategies or suggestions. Six studies use or suggest that case-based interventions can improve CT students; such interventions include simulations, clinical conferences (13) and case studies / case methods. This intervention usually involves asking students to solve problems in a given scenario or case. In addition to questions, reflective writing, and case-based interventions, there are other strategies for promoting CT. These strategies include good teacher experience, an art-based workshop, and concept maps. Based on the above findings, the nursing curriculum strives to develop interventions to maximize CT students.

## 8. Conclusion

Teaching students high-level cognitive skills, especially critical thinking, can help individuals improve their function in various circumstances (24). These critical thinking

skills are suitable for equipping students in higher education before they enter different workplaces. Critical thinking skills also relate to the goal of higher education to build responsible citizens because today's complex society is increasingly increasing, and requires individuals to base their assessment and evaluation decisions on careful evidence. Educational strategies in developing critical thinking skills by supporting the use of questions, small group activities, role plays, debates, use of case studies, journals, simulations, puzzles, problem solving and writing assignments. Teaching critical thinking to nursing students is very important and must start early, because this cognitive skill enables them to achieve better clinical performance and improve the quality of patient health outcomes. Nursing students who think critically in line with creative thinking and innovation will be useful to survive in the dynamics of the industrial revolution 4.0 and beyond in the world of the future.

## Funding

All authors declare no funding for this study

## Acknowledgement

The authors would like to thank their colleague for their contribution and support to the research. They are also thankful to all the reviewers who gave their valuable inputs to the manuscript and helped in completing the paper.

## Conflict of Interest

The authors have no conflict of interest to declare.

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