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Current issue in the Technical Vocational Education and Training (TVET) instructor

Asnul Dahar Minghat[1,], Siti Salina Binti Mustakim[2], Nuraini Shahroni[1]*

[1] Universiti Teknologi Malaysia, Malaysia

[2] Faculty of Educational Studies, Universiti Putra Malaysia, Serdang, Selangor, Malaysia

*Correspondence: E-mail: asnul@utm.my, mssalina@upm.edu.my

ABSTRACTS

This paper explains current issues in the technical vocational education and training (TVET) instructor. This paper provides an overview of the TVET system, three elements of competency which are knowledge, skills, and attitudes, and the challenge of IR4.0. along with the research background, problem statement, and research question. The research objectives as derived from the problem background and problem statement are presented. The scope, significance, and conceptual framework of the research are also presented.

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1. INTRODUCTION

Technical Vocational Education and Training (TVET) is the education and training that include formal, non-formal, and informal learning that prepares young people with knowledge and skills for employment (Tripney & Hombrados, 2013). TVET system is well-recognized worldwide for example, in Germany, the TVET system is highly recognized due to its combination of theory and training embedded in a real-life work environment (Reinhard *et al*., 2016). Meanwhile, in Australia, the TVET system is very well-known due to its strong focus on industry demand, skills application, and to its scalability and flexibility (Karmel, 2014). And in China, the TVET system has successfully enhanced the employability of its labor force and can contribute to China's social and economic development (Li & Pilz, 2019).

In Malaysia, the TVET program is offered at certificate, diploma, and degree levels by seven ministries that include the Ministry of Human Resources, Ministry of Higher Education (MOHE), and Ministry of Youth and Sport (KBS). There are over 1,000 TVET institutions in Malaysia of which 506 are public institutions like polytechnics, community colleges, vocational colleges, and other higher learning institutions. Public Skills Training Institution provides different skills training and education under different agencies. For example, the Ministry of Human Resources offers courses under three agencies: Advanced Technology Training Centre (ADTEC), Japan-Malaysia Technical Institute (JMTI), and Industrial Training Institute (ITI); Ministry of Higher Education offers courses under college community; and the Ministry of Youth and Sport offers courses under three agencies: National Youth Skills Institute (NYSI), National Youth Technology Skills Institute (NYTSI) and Golf Youth Skills Academy (GYSA).

The Youth Skills Development Division (YSDD) through the Youth and Sports Skills Training Institute (YSSTI) under the Ministry of Youth and Sports (MYS) offers practical and practical training to provide youths with the knowledge and skills needed to pursue selected careers after graduation. Three institutions in charge are National Youth Skills Institute (NYSI), National Youth Technology Skills Institute (NYTSI), and Golf Youth Skills Academy (GYSA).

The need for strengthening TVET system has been widely acknowledged in numerous countries and unions (Yazçayır & Yağcı 2009) due to technical innovation and globalization (Wilson, 2001). Currently, the presence of Industrial Revolution 4.0 (IR4.0) has posed challenges to the economy and industry in Malaysia. The education field is among those that receive a direct impact, especially at the post-secondary and tertiary level because it is the basis of supplying the manpower to ensure that the country has enough human capital and to ensure the country remains survive and competitive, globally.

With the presence of IR4.0, an emphasis on continuous competency-based professional development will produce a higher quality of TVET instructors that meets the suitability and needs of society in the twenty-first century (Tanloet &Tuamsuk, 2011). Therefore, one of the important aspects in the reinforcement of the TVET system to deal with IR4.0 is the level of competence of TVET instructors in knowledge, skills, and attitude. Thus, this research aims to identify the level of competency of TVET instructors toward IR4.0 and to develop a competency index for TVET instructors toward IR4.0.

2. METHOD

This study is a literature review. We collect data from news and international articles published in journals. Detailed information for the way how to collect data is explained in elsewhere (Azizah *et al*., 2021).

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3. RESULTS AND DISCUSSION

3.1. Problem Statement

A preliminary study has been done to identify the problem faced by TVET instructors at Public Skill Training Institution. According to Huzaimi (2021), he stated many TVET instructors have a problem to adapt with the changes brought by industrial revolution 4.0. Industrial revolution 4.0 and sometimes referred to as IoT or smart manufacturing combines physical production and operations with smart digital technology, machine learning, and big data to create a more holistic and better-connected ecosystem. Malaysia's government several times mentioned industrial revolution 4.0, however, the policy given by the government has no specific guidelines for education industrial. Thus, TVET instructors encounter difficulty to adapt with the changes brought by IR4.0 and they also cannot evaluate their competency concerning IR4.0's requirements.

The TVET instructor's task is not only teaching but also preparing material to be used in the classroom and practical workshops. He emphasized most of his colleagues have difficulty preparing teaching material regarding IR4.0. He said there is no specific regulation and instruction about the competency needed by TVET instructors towards IR4.0 on how and what to prepare for themselves. This situation would put the student's future at risk. He suggested TVET instructors should have competency regulations regarding IR4.0 so they would know their deficiency at which part based on IR4.0's pillars. The foundation of IR4.0 is based on nine pillars of technological advancement consisting of additive manufacturing, augmented reality, autonomous robots, big data analytics, cloud computing, cybersecurity, IoT, simulation, and system integration. Many TVET instructors would not even know or remember the nine pillars of IR4.0 which that is the fundamental knowledge of IR4.0. In terms of skills, the very basic skill needed in IR4.0 is programming, however, some TVET instructors who found difficulty in mastering the programming language.

core challenges faced by TVET instructors in Public Skills Training Institutions are lack of motivation in teaching advanced subjects and lack of skill qualification. She stated that the inadequacy in competencies affects the quality performance of TVET instructors at TVET institutions in Malaysia. IR4.0 has imposed the landscape of teaching pedagogy which leads to TVET instructors must improvise and upgrade their knowledge and skills on the same level as current technological advancement. Ridzwan *et al*. (2017) highlighted that incompetent instructor are one of the factors that contribute to the unemployment of TVET students in Malaysia. Based on their interviews with lecturers, teachers, and industrial workers, the issues of incompetent instructors reside in their teaching methods, weak classroom management, lack of competency skills, and disinterest in teaching the assigned subjects.

TVET instructor plays an important role both in the institution and students' future. TVET instructors have been long known as the backbone of countries' economic development. To put it another way, the professionalization of TVET instructors is considered a crucial issue affecting TVET education's effectiveness in producing competent workers. It is also widely agreed that the quality of any education system ultimately depends on the quality of interactions and relationships that occurs between a learner or learners, particularly the TVET instructors who are interacting directly with the learners. Therefore, the quality of TVET instructors is crucial to determining the skills of future workers. Without adequate numbers of professionally qualified and competent instructors, TVET cannot offer qualified skilled workers. Without adequate numbers of professionally qualified and competent instructors, TVET cannot offer the qualified skilled workers. Preparing TVET instructors for TVET presents a complex set of challenges. One of the challenges in TVET education is that the knowledge and skills of TVET instructors can soon become outdated in a short period. This occurs as a

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result of rapid technological change. The presence of the 4th Industrial Revolution affects the economy as well as TVET education. New technologies demand the latest and upgraded knowledge and skills. To fulfill the government's need to produce a skilled and qualified human capital to face the challenges of new technologies, TVET instructor needs to occupy themselves with knowledge, skills, and attitude that are relevant to the current trend.

According to Ismail and Hassan (2019), they found out the competency of TVET instructors towards IR4.0 was found to be at a moderate level for knowledge competency and a low level for skill competency. 43.74% of TVET instructors have a moderate level of competency and 9.38% of TVET instructors have a low level of competency. The knowledge competency of TVET instructors were at a moderate level while the skill competency of TVET instructor showed a huge gap between the existing skill and IR4.0 skill. The need to improve TVET instructor knowledge and skills competency. The TVET instructors have a moderate level of skill competency. Meanwhile, Lai *et al*. (2020), indicate the attitude competency of TVET instructors was at a moderate level. The attitude competency includes professionalism, management, self-learning, and a positive mind.

From the previous study, the findings show unsatisfying results regarding the competency of TVET instructors. TVET instructors play the biggest role to shape the future of TVET students. A competent TVET instructor will yield competent human capital. Competent instructors can provide more effective guidance for their students. Accordingly, a competent TVET instructor delivers effective performance (Arifin & Rasdi, 2017) and a knowledgeable instructor with cognitive capacities contributes to the learning achievement of students. Therefore, the reinforcement of the TVET system should begin with the main player which is the TVET instructor. With the presence of the 4the revolution industry, the existence of new technologies yields new types of job scope and different types of skills needed. IR4.0 become an evolution that combines the biological, physical, and digital worlds to produce new technologies (Hamzah *et al*. 2021). To understand IR4.0 better, nine interrelated pillars of IR4.0 should be known as shown in **Figure 1**, regarding automation, data exchanges, cloud computing, cyber-physical systems, robots, big data, artificial intelligence (AI), internet of things (IoT), and semi-autonomous industrial techniques. According to Mustafa (2018), these changes indicate the transformation of entire systems of production, management, and human resources.

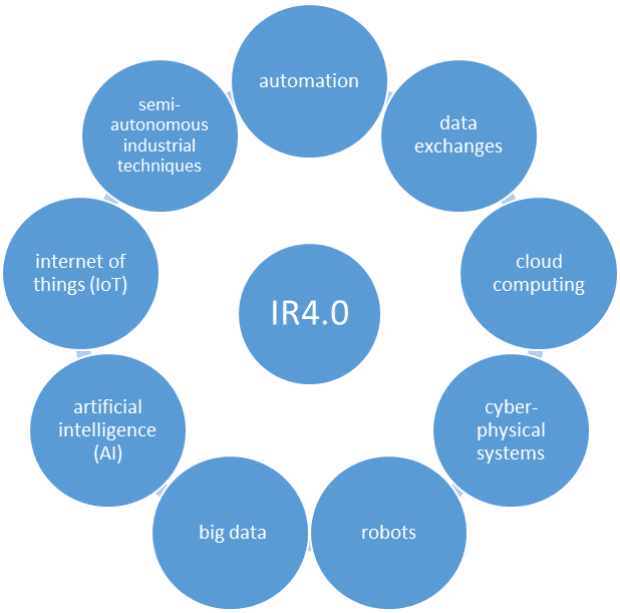

Figure 1. Nine pillars of IR4.0.

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One of the important roots to accommodate this challenge of TVET education to maintain a qualified and competent instructor is to develop a competency index. For the past few years, many researchers studied the competency of TVET instructors. However, the research about the competency index of TVET instructors toward IR4.0 has not been done yet. From the 4th edition of Kamus Dewan, Index can be defined as "*a list of words or phrases and associated pointers or indicators to where useful material relating to that heading*". The Competency Index is a list of competencies that can be used to evaluate the knowledge, skill, and attitude competency which are needed by individuals to perform a defined activity or deliver a measurable outcome. The competency Index will be a valuable resource for TVET instructors to identify and obtain the support and training needed to improve their competency.

Competency index is a list of competencies that can be used to evaluate knowledge, skills, and attitude competency to perform a defined activity or deliver a measurable outcome. The level of competency of TVET instructor has been discovered from previous studies which stated most of the findings had moderate to low level competency in the aspect of knowledge, skill, and attitude competency. Therefore, to carter this problem, a competency index should be developed. The competency index will be constructed as a checklist for the instructor to evaluate their performance as TVET instructor. This competency index focuses on to identify the element of competency index the reliable to IR4.0 so that TVET instructor and TVET institution can see clearly the competency gap and problem that TVET instructors face in dealing with IR4.0 alongside come out with the solution to improve their competency and to upgrade the TVET system as well.

Table Error! No text of specified style in document.**.** Summary of previous researches about level of competency of TVET instructor.

Competency elements	Description	Source
Moderate level of knowledge competency Low level of skills competency	Findings from the survey concluded that the level of knowledge and skills competency toward IR4.0 is still at unsatisfaction level and requires a lot of improvement.	Ismail *et al*. (2018)
43.73% has moderate level of competency 9.38% has low level competency	The level of competency from this research includes all three elements which are knowledge, skills, and attitude. However, the research conducted has no relation with IR4.0.	Bakar (2018)
Huge gap between 2015 skills and 2020 skills	There are the differences between existing skills and IR4.0 skills. To adapt with new era of IR4.0, new and upgraded skills are needed	Kamaruzaman *et al*. (2019)
Moderate level of attitude competency	The findings reveal that there is a significant difference in attitude competency to apply the IR 4.0 elements in the teaching process.	Lai *et al*. (2020)
Lack of knowledge and skills competency	The research highlighted the need to improve TVET instructor knowledge and skills competency.	Ismail *et al*. (2017)

3.2. Research Objectives

The main objective of the study is to develop a TVET index of competencies among TVET instructors in the Public Skills Training Institution for the 4th Industrial Revolution. Specifically, the study seeks to:

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(i) Determine the levels of knowledge, skills, and attitude among TVET instructors in the Public Skills Training Institution for the 4th Industrial Revolution.
(ii) Determine the types of training among TVET instructors in the Public Skills Training Institution for the 4th Industrial Revolution.
(iii) Develop a TVET index of competencies among TVET instructors in the Public Skills Training Institution for the 4th Industrial Revolution.

3.3. Research Questions

In order to reach the research objective of the study, three research questions are formulated below:

(i) What are the levels of knowledge, skills, and attitude among TVET instructors in the Public Skills Training Institution for the 4th Industrial Revolution?
(ii) What are the types of training required among TVET instructors in the Public Skills Training Institution for the 4th Industrial Revolution?
(iii) How does the TVET index of competencies among TVET instructors in the Public Skills Training Institution for the 4th Industrial Revolution is developed?

3.4. Significance of Research

Significance of this research is a competency index will be developed. To build the competency index, the researcher will identify the elements of competency index toward IR4.0 and the level of competency of TVET instructor toward IR4.0. This competency index will help the TVET instructor to acknowledge the gap of IR4.0 competency they might have and help them to improve their incompetency. In addition, the competency index will help the education institution to assess their staffs' competency, hence provide support or training to improve the TVET instructor's competence.

This study will help the Ministry of Youth and Sport (KBS) in particular public or private institutions of higher learning in preparing TVET instructor to become specialized, highly skilled, competent, and efficient to adapt with the revolution of IR 4.0.

3.5. Scope of Study

This research will develop a competency index of TVET instructor for IR4.0 through a qualitative approach and quantitative approach as the methodology of this research. Three competency elements which are knowledge, skills, and attitudes will be used as main reference to identify the items of the element of the competency. Competency index is a list of competencies of knowledge, skills, and attitude to perform a defined activity or deliver a measurable outcome. Delphi study will help the researcher to structure the competency index. And survey study is to identify the level of competency of each element. At the end of the research, a complete competency index of TVET instructor will be developed and evaluated using a quantitative study.

The focus of IR4.0 in this study is mainly on the pedagogical approach of the instructors to integrate the utilization of theory and practices in the instructional practices. This means; teaching students about technology as part of the curriculum, changing the approach to learning altogether, and utilizing technology to better improve the learning experience. The infusion of IR4.0 is crucial among TVET instructors due to the impact of IR 4.0 that sees education as a teaching and learning skill that can adapt to individual styles and strategies. Teachers need to see innovation as a must in the teaching and learning process because innovation can save time and increase student interest in learning.

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The ILKBS is chosen specifically in the study due to the highest number of electrical and electronic program related to skills development in TVET industries. This IKBN opposes to other institution is given dominantly into *Sijil Kemahiran Malaysia's* performance benchmarked form the high schools' performance of each student. TVET instructors assigned into the programs offered in ILKBS are given streaming prior to their selection as instructors in ILKBS.

3.6. Conceptual Framework

Conceptual framework serves as a guideline to conduct this research. A conceptual framework must consist of the overall idea about the research process. In this section, researcher will explain the constructed conceptual framework to ensure the objective of the research are obtained. Model is the conceptual representation that shows the relationship between the elements and theories. The theory used is important because it will become the foundation to make deductions (Quinn *et al*., 1999).

The research conducted will be determined the competency index, identified the elements of competency index, identified the level of competency of TVET instructor and constructed competency index of TVET instructor toward IR4.0. There are three important things as a foundation to develop conceptual framework. The first thing is competency elements which are knowledge, skills, and attitudes. To develop the competency index, the ASK competency model (knowledge, skills, and attitude) was applied. The model is illustrated in **Figure 2**. There is also other popular model such as the European Qualification Framework EQF. However, this model does not include attitude section. As this area is seen to be very essential for developing competency index, researcher decides to use ASK-model to describe competency standard.

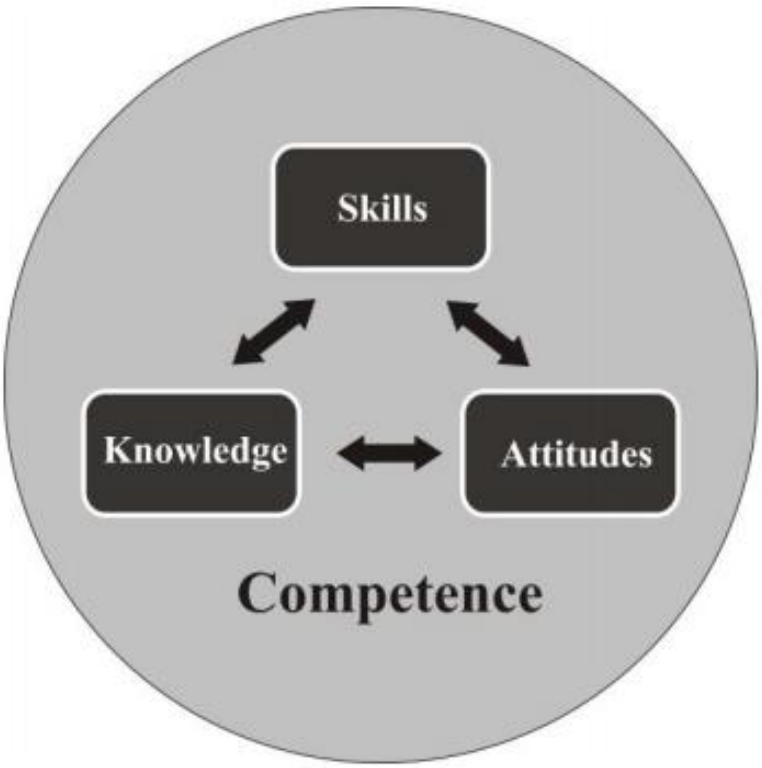

Figure 2. ASK-competency model.

Next, process section in conceptual framework, there is two phases will be conducted to identify the important of competency index and to identify the elements of competency index

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of TVET instructors towards IR4.0. Phase 1 involves Deplhi study which 10 expert panel will be interviewed to determine the competency index. A questionnaire will be formed from Phase 1 and it will be used in Phase 2. Phase 2 involves survey study to identify the level of competency TVET instructor towards IR4.0.

At output section, researcher will analyze quantitative data from survey study using SPSS. Finally, a competency index of TVET instructor towards IR4.0 will be constructed. Competency index serves as a guide to identify what needs to be accomplished to achieve excellence on the job. Those who are creating training like Department of Human Resource can align training against competency index to see if TVET instructors have what is required, and also TVET instructor can align their performance against competency index and see if they need any support and training. **Figure 3** shows the research conceptual framework.

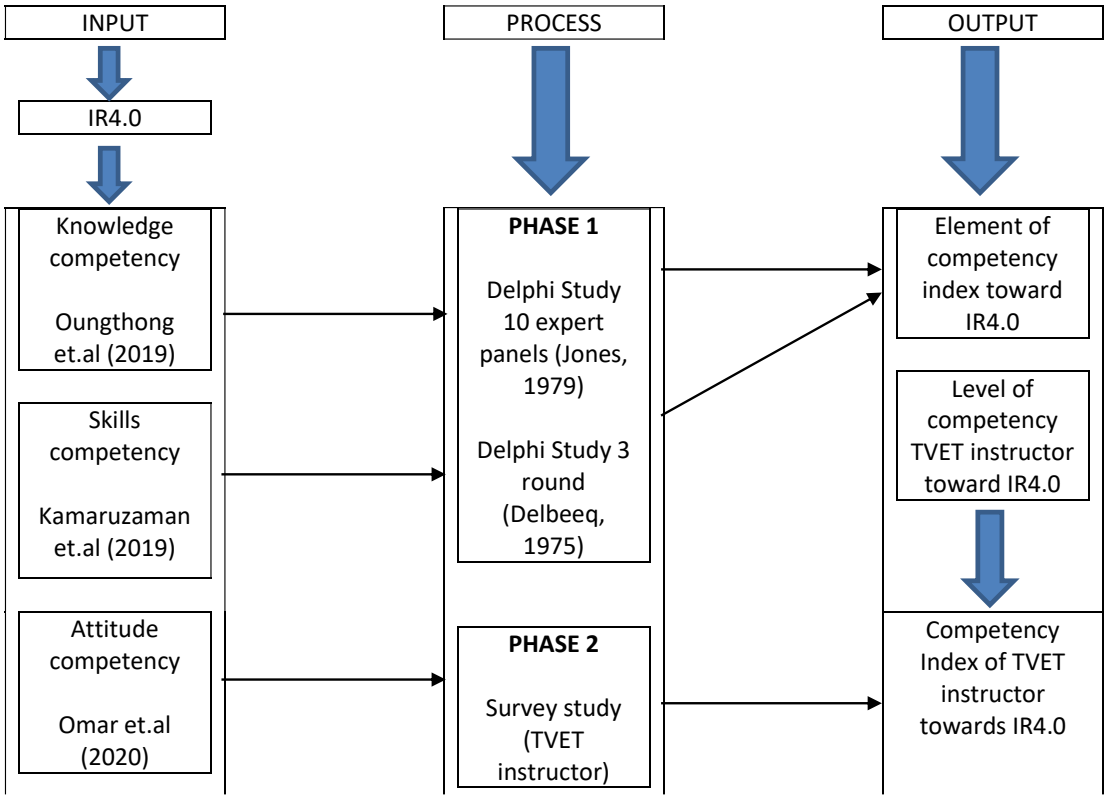

Figure 3. Research conceptual framework.

3.7. Operational Definition

3.7.1. TVET

TVET stands for Technical and Vocational Education and Training. TVET is one of education system that implemented in Malaysia under several agencies such as Golf Youth Skills Academy (GYSA), National Youth Skills Institute (NYSI), and National Youth TECHNOLOGY Skills Institute (NYSI). This research focus on TVET instructor that teaches at NYSI and NYTSI which they are the research population of this study.

3.7.2. IR4.0

IR4.0 refers to nine pillars of technology which are automation, data exchanges, cloud computing, cyber-physical systems, robots, big data, artificial intelligence (AI), internet of things (IoT) and semi-autonomous industrial technique. IR4.0 is the variable to evaluate the competency of TVET instructor toward current technology.

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3.7.3. Knowledge competency

Knowledge competency refers to the ability to put knowledge into action. Knowledge competency in this research refers to the ability of TVET instructor to put the knowledge of IR4.0 into action especially during teaching and learning session.

3.7.4. Skills competency

Skill competency refers to the ability to perform an action with determined results with good execution within a given amount of time, energy, or both. Skill competency in this research includes the ability of TVET instructor to analyze and solve the complex problem, having good judgement and creative.

3.7.5. Attitudes competency

Attitude competency refers to the personality behaviors that TVET instructor should possess as part of their personality. According to Omar *et al*. (2020) attitude competency refers to professionalism, positive mind, ability to manage students' disciplinary issues, and ability to encourage students to participate in a practical-based learning environment.

3.7.6. Competency index

Competency Index refers to a list of competencies that can be used to evaluate the knowledge, skill, and attitude of TVET instructor. Competency index is the final product of this research which includes three elements of competency and its benchmark.

4. CONCLUSION

This chapter provides an overview of TVET system, three elements of competency which are knowledge, skills, and attitudes and the challenge of IR4.0. along with the research background, problem statement, and research question. The research objectives as derived from the problem background and problem statement are presented. The scope, significance and conceptual framework of the research are also presented.

5. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. The authors confirmed that the paper was free of plagiarism.

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