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CW+R Curriculum in the Era of Education 4.0: Trials on the Doctoral Program for Primary School Teacher Education Sunan Kalijaga State Islamic University Yogyakarta

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Abstract

The research objectives describe the CW+R curriculum profile, explore the relationship between the CW+R curriculum and education 4.0, find the impact of model implementation in building a true scientist mentality, predict the completion of doctoral program students. The method used in this research is R&D with steps: describing the existing curriculum, finding the philosophical basis of the curriculum, designing the model concept, compiling the model mechanism, validating the model, and testing the model. Model results in the good category p = 0.06323 (standard p> 0.05), RMSEA = 0.058 (standard RMSEA < 0.08). The contribution of the model philosophy is 0.99; very strong philosophical foundation, concept 0.83; the concept of the model is also very strong, operationalization 0.40; less strong because the model is still in the trial stage for one semester. the relationship between the operationalization of the model with education 4.0 is 0.06; still very weak therefore there needs to be empowerment to educators about education 4.0. mentality of a true scientist: problem solving ability 3.481, scientific method 4.115, couriosity 3.615 with a maximum score of 5,000. Scientific method has a very high score, which is an optimism that the model is able to build a true scientist mentality. Timely completion of the study tends to be achieved with this CW+R curriculum.

Keywords: *Curriculum, Education 4.0, True Scientist*

INTRODUCTION

The doctoral program for Primary School Teacher Education at Faculty of Education Sunan Kalijaga State Islamic University Yogyakarta is the first program in Indonesia and the only one until right now. This program operates in accordance with the decree from the minister of Religion, Republic of Indonesia number 280 of 2023 dated April 27, 2023. The motto designed by the management is "Innovation Through Discovery of New Science to Build a Better Future". The vision is "Advanced in the field of basic education that integrates and connects with Islamic sciences to ensure the future generation of advanced technology".

As a relatively new study program, of course, currently it's stabilizing it self in order settles down, and looking for forms in various aspects, including the management, as well as curriculum management. Curriculum is the main aspect for a study program. The success of education is inseparable from the existence of the curriculum used. The curriculum referred to in this study is the curriculum document and its implementation, namely the learning process.

The results of interviews (April-May 2023) on curricula in various other doctoral programs (despite their different areas of expertise), found that the majority in Indonesia apply the by coursework curriculum. Meanwhile, several overseas doctoral programs tend to apply the model by research. When conducted a more in-depth interview, both of them had their reasons. For programs that apply the by research model, the reasons are as follows: scientifically based, relevant to student needs, continuous improvement, effectiveness in learning, development of critical skills, as well as legitimacy and transparency. Coursework is work performed by students

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or trainees for the purpose of learning. Coursework may be specified and assigned by teachers, or by learning guides in self- taught courses. Coursework can encompass a wide range of activities, including practice, experimentation, research, and writing.

The doctoral program for primary school teacher education will develop a combination model of both namely by coursework and research which will be abbreviated and will be the name of a model being developed namely CW+R (coursework & research). The research that will be carried out will not only stop at the concept of the model, but will first explore its philosophical foundation. After finding the basic philosophy and concept of the model, the steps for implementing the model are developed.

The model will be found is still a hypothetical model. To finalize the model of course it is needed try out, that is the doctoral program for primary school education, Sunan Kalijaga State Islamic University Yogyakarta. This research is highly guaranteed originality because it is still rare for similarity; even there is no such research yet. In order the model found having a high scientific quality, model validation was also carried out by experts from Indonesia as well as overseas, namely childhood education study program, University of Victoria Wellington The Herenga Waka New Zealand. In addition, validation is also carried out by Lisrel application to check the goodness and fitness of the model.

THEORITICAL BASIS

Education for Doctor Program by Coursework

An education for a doctorate program by coursework typically refers to a professional doctoral degree that emphasizes coursework and practical training rather than a research-oriented Ph.D. or similar research-focused doctoral program. This type of doctorate is often pursued in fields where professional expertise and advanced practical skills are crucial. Here's an overview of what an education for a doctorate program by coursework entails: Coursework emphasis: In a doctorate program by coursework, the primary focus is on completing a rigorous set of advanced courses and seminars. These courses are designed to deepen the student's understanding of the subject matter and develop specialized expertise. Practical training: along with coursework, these doctoral programs may include opportunities for hands-on training, internship, or fieldwork. The emphasis is on gaining practical experience relevant to the professional field; Dissertation or capstone project: some doctorate programs by coursework may still require students to complete a dissertation or capstone project. However, the focus is usually more on applied or practical aspects rather than original research. Professional development: these doctoral programs often aim to develop the student's leadership, managerial, and problem solving skills relevant to their chosen profession. Duration: shorter than research-focused Ph.D programs; Career outcomes: taking on leadership roles, and applying their specialized knowledge in practical settings.

Education for Doctor Program by Research

The research Doctoral Program (Doctor by Research) is an educational program that aims to produce scientists who are independent, ethical, cultured, capable of discovering, creating, updating, and enriching the repertoire of science, technology and art, with an emphasis on research activities. An education for a doctorate program by research typically refers to doctor of philosophy or other doctoral-level research-oriented programs. Here is an overview of what an education for a doctorate program by research entails: (1) Research Focus: The core emphasis of a research-based doctorate program is on original research. Students are expected to identify research gaps, formulate research questions, design experiments or studies, collect data, analyze findings, and draw meaningful conclusions; (2) Rigorous Curriculum: While coursework might be a component of doctoral programs, the emphasis is often on specialized research-related courses and seminars to develop research skills, critical thinking, and academic writing; (3) Dissertation/Thesis: A significant part of the program involves the completion of a doctoral dissertation or thesis. This document is a comprehensive and original piece of research that contributes new insights to the chosen field of study; (4) Faculty Supervision: Doctoral candidates typically work closely with faculty advisors or supervisors who guide and support their research endeavors; (5) Duration: Doctorate programs by research can be time-consuming, often spanning several years, depending on the field of study and the nature of the research; (6) Contribution to Knowledge: The goal of a research-based doctorate

is to make a significant and original contribution to the academic discipline or field of study, advancing the knowledge base and furthering understanding; (7) Academic Career Path: Doctorate graduates from research programs often pursue academic or research-oriented careers, such as becoming professors, researchers, or experts in their respective fields

Education 4.0

Education 4.0 is a term that refers to the evaluation of education in the digital age, driven by technological advancements and the integration of cutting-edge technologies into the learning process. It represents a significant shift in how education is delivered and consumed, moving away from traditional classroom-based models to more personalized, interactive, and technology-driven approaches. Features of education 4.0: Personalized learning which is use AI; Technology integration; Blended learning; Lifelong learning; Collaboration and connectivity; Project-Based Learning; Competency-Based Learning; Teacher's Role: facilitator, mentor, and guide; Data-Driven Decision Making; Accessible Education (Newman, 2017)

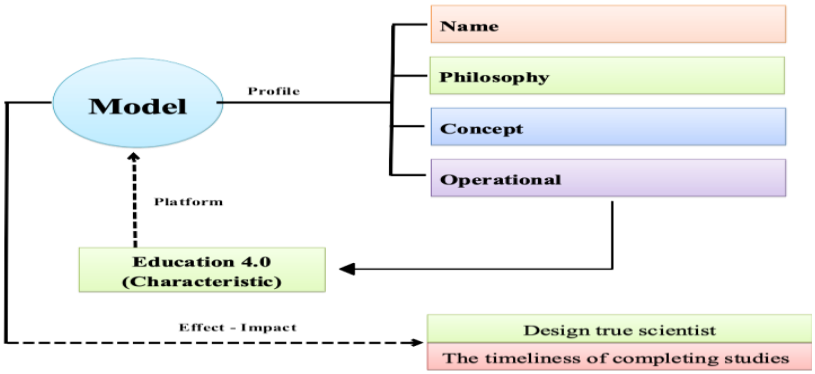


Figure 1. *Frame of Thinking of the Research*

Preliminary Research Studies

The first; Research done by (Salifu & Agbenyega, 2021) title "Doctoral Students' Learning Experiences In Ghana: Exploring New Curriculum Using Bourdieu's Concepts". Findings The research found that, although the participants were broadly satisfied with some aspects of their programs, the additional cost associated with its duration, the lack of quality and timely feedback from supervisors, and difficulty accessing conference funding were key challenges to achieving the ultimate goals of the new doctoral curriculum. Recommendations for Practitioners The paper draws attention to human dispositions, values, and beliefs (habitus) which operate with different forms of capital in fields of doctoral training. Recommendations for Researchers Researchers may focus on tools that help to transform supervisor habitus and the kinds of support that work for individual students. Impact on Society The strongest message gleaned from this study is that to improve doctoral students' learning experiences, it is necessary first to develop a student-supervisor relationship built on mutual respect, clear timelines for achieving supervision targets, and commitment to achieving the targets

The second; Research done by (Lee et al., 2010), et all title "The Essential Research Curriculum for Doctor of Pharmacy Degree Programs". The content of the research is follows: This commentary provides a brief overview of the essential knowledge, skills, and outcomes of a research curriculum for Pharm.D. degree programs. These curriculum components will position pharmacy school graduates to understand the importance of research and its applications to practice. This perspective is provided as an aid and a challenge to those in leadership and teaching positions within schools and colleges of pharmacy.

The third; Research done by (Carter, 2022), title "School Improvement Plan: Updating Curriculum, Technology and Classrooms for Education 4.0". This school improvement plan describes Education 4.0 and elucidates the critical need for updating school curriculum and teaching methods. Our education system is largely outdated

and ill prepares students for their future. The following improvement plan seeks to transform pedagogy into that which is student centered. To do this, schools must update their curriculum and teaching methods, implement the latest technology, and redesign the classroom setting. Through this project, I will identify the reasons for needed change in schools and explain Education 4.0.

The differences and similarities between this research and previous research are 1) focusing on doctoral programs, 2) referring to education in the current era, in the future. While the difference is that this research is research and development research, while previous research is not development research. This research is very philosophical but implementative. The frame of thinking of this research as follows.

Research Question:

How is the profile of the model?

Is there a connection between the operationalization of the model and education 4.0?

What is the impact of the model in developing the mentality of a true scientist?

What is the student's perception of the timeliness of completing doctoral studies as a result of implementing the CW+R curriculum?

METHOD

The type of the research is Research and Development (Borg & Gall, 1983) which is modified. The steps are: (1) Description of the existing curriculum, (2) Discovering the basic philosophy of the CW+R model, (3) Exploring the concept of the model, (4) Developing the mechanism of the model, (5) Model validation – by experts, (6) Model validation – by Lisrel, (7) Model revision, (8) Try out the model, (9) Model revision, (10) Final model, and Model dissemination.

The data analysis technique is as follows: (1) Recognizing the name of the model, (2) Discovering the basic philosophy of the CW+R model – Through library research – Answering the question "why CW+R", (3) Exploring the models concept, (4) Developing the model mechanism – Description of the steps in implementing the CW+R model, (5) Model validation – by experts (Jenny Ritchie from Victoria University New Zealand and Prof. Sumaryanto, from Yogyakarta State University), (6) Model validation – by Lisrel V.10 – Data collection using a Likert scale questionnaire – Data will be taken from lecturers as well as students in Program For Primary School Teacher Education and Islamic Education, Sunan Kalijaga State Islamic University, (7) Model revision – It is called hypothetical model , (8) Model trial – will be conducted in Program For Primary School Teacher Education Sunan Kalijaga State Islamic University - As executor are five lecturers with different subjects, (9) Model revision – hypothetical model 2, (10) Final model, and (11) Model dissemination – conducted through workshop for lecturers in Phillipine Woman University.

RESULT AND DISCUSSION

Model Profile

Based on the result of data analysis from 52 respondents, the profile of CW+R curriculum model is described in Figure 2 below.

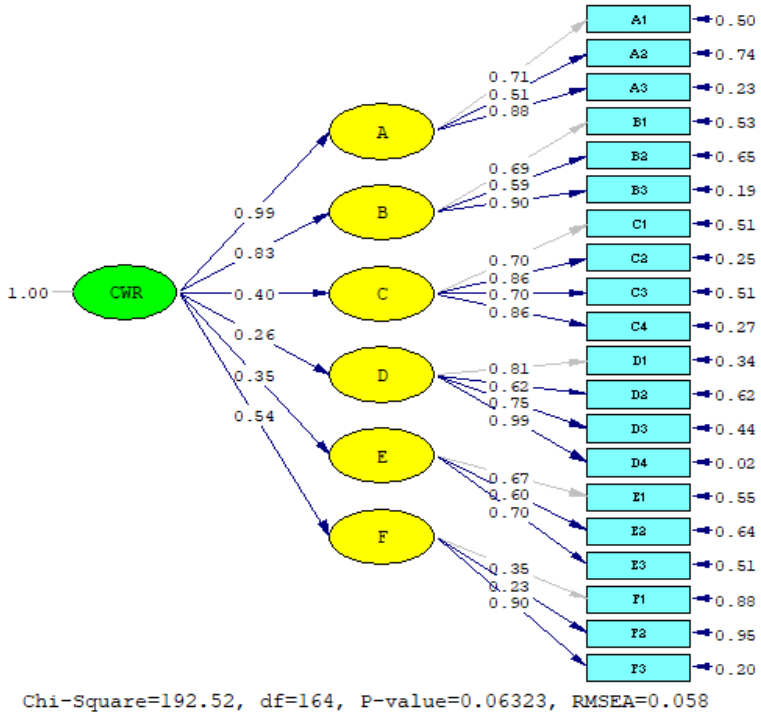


Figure 2. *The Description of The Model*

The model can be declared "good" because it meets two standar criterias, namely p > 0.05 and RMSEA < 0.08. The p value obtained was 0.06323, while the RMSEA value was 0.058 with a standard value of 0.00. There are three elements that build this model, namely the model philosophy, concept and operationalization.

The basic elements of the model's philosophy contribute very strongly to the model, it is 0.99 where the maximum value is 1.00. The model philosophy is built from the keyword "Humans are unique creatures". This statement is also very strong in building a model, it is 0.71. As revealed in the holy verse of the Al-Quran that Alloh S.W.T created various human beings, different from each other (Fitriana et al, 2018). God created humans on this earth to be different from one another (Brain et al., 2009). The second statement "Nature & technology continues to develop and currently life on earth is in an era of disruption" makes a less strong contribution, namely worth 0.51, although it can still be accepted as a contribution. We are now in an era of disruption. Natural changes can change quickly. Science continues to develop (Park et al., 2023). The third key words for the philosophical basis of the model is "Humans are Dasein – Humans are active creature makes a high contribution 0.88. This statement is in accordance with the opinion which states that the desire and urgency to move is a motivational state that is influenced by emotions and can influence human physical behavior from one moment to the next, with the desire to move frequently (Engelland, 2015). The desire to move in humans often arises from positive or negative reinforcement (Stults-Kolehmainen et al., 2020).

The "model concept" element contributed 0.83 in building the model, this means that this element is very strong too. The model concept consists of three keywords, namely (1) the need for science, (2) research, and (3) new science. The contribution of the need for science in building the model concept is worth 0.69, this means moderate. The research contribution is worth 0. 59, this means medium. The contribution of "new science" is very strong 0.90. the model developed is very suitable to the concept contained in it, especially the keyword building new science. As the name and process suggests, this model is oriented towards developing students who are able to discover new science, both applied sciences and educational philosophy. The curriculum developed is oriented towards building true scientists who are able to discover new science. Through coursework and research, new science will be discovered that is novel and innovative. This thinking is supported by a thought which states "a learning process that focuses on building science through active research and

developing new science can essentially increase students' innovative and critical abilities", as described in constructivist learning theory and research in education (Jaccard, 2013). Picture 3 is the CW+R curriculum model concept.

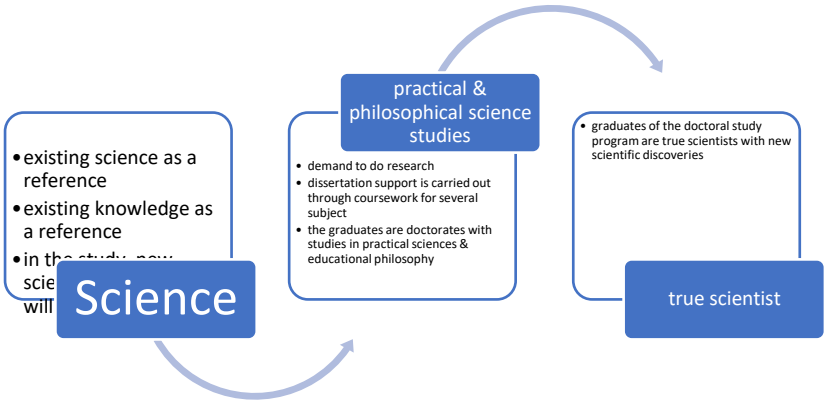


Figure 3. *The CW+R Curriculum Model Concept*

The model operatinalization elementi s still weak in contributing to building the model, namely 0.40. In reality, the model developed has not been fully implemented. The new model is implemented for one semester. The weak contibution of this element could be cauesed by the model not having been implemented. Respondents' perceptions may be influenced by this. However, when we look closely at each indicator in the operationaliuzation element of this model, all indicators contibute highly to building the operationalization element. The elements and amount of contribution are as follows (1) preparing the disssertation draft 0.70, (2) mapping the dissertation theme 0.86, (3) selecting subjects 0.70, and (4) preparing the dissertation 0.86. This reserach will continue to improvise the operationalization that there will need to be steps to implement a more rigid model.

The Compatibility of Model Operationalization with Education 4.0

This research attempts to contextualize the operationalization or application of the model with education 4.0. The basis for considering this idea is that currently the educational phenomenon is in the era of education 4.0. The thinking behind the Education 4.0 era is characterized by the integration and fusion of various digital technologies, including 4IR technology, and includes learning methods such as flipped classrooms, MOOCs, and social network-based learning (Chaka, 2022).

The compatibility between the operationalization of the model and education 4.0 can be seen in Figure 4 below

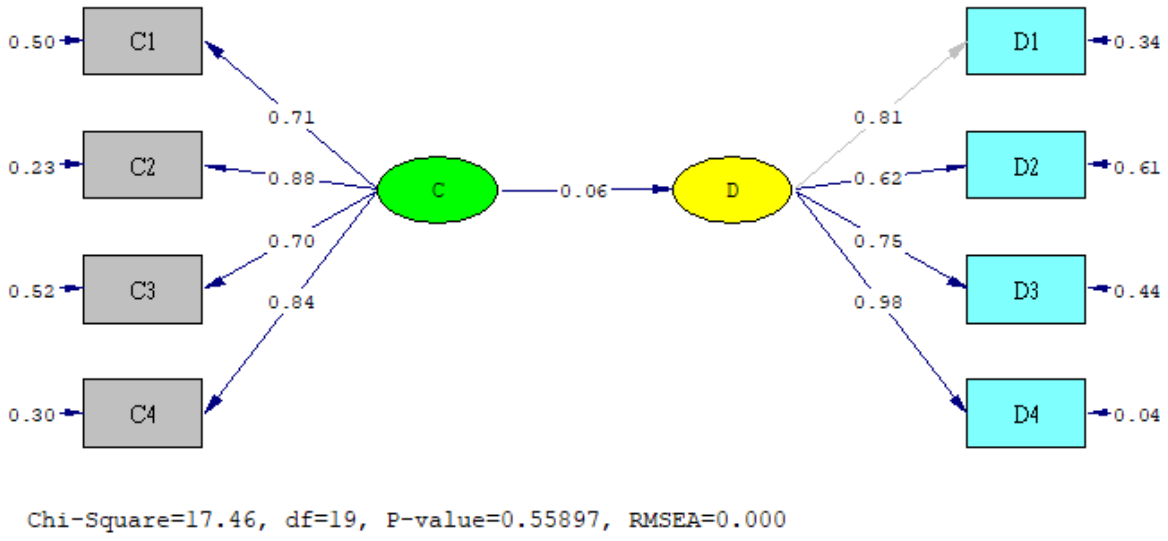


Figure 4. The Compatibility between the Operazionalization of the Model with Education 4.0

Based on the results of data analysis in Figure 4 above, the suitability between the operationalization of the model and Education 4.0 is very low, namely 0.06 with a standard of 1.00. The operationalization of the model includes the steps for preparing a dissertation draft, mapping the dissertation theme, selecting main subjects through course work, and supporting subjects through research, as well as preparing a dissertation. There is a possibility that the suitability is still very low because this is a hypothetical model, which means this model has not been implemented in the field. When respondents were asked about education 4.0, most of them did not understand education 4.0. Moreover, when asked about the characteristics of education 4.0, there is no appropriate answer. The mind set of educators and prospective educators in Indonesia is still based on the old paradigm. Sometimes there are some educators who apply some of the characteristics of education 4.0 without meaning to. Even though theoretically the suitability of the two is very low, the implementation of the model is assumed to have good effects and impacts (see research results at the bottom of this paper).

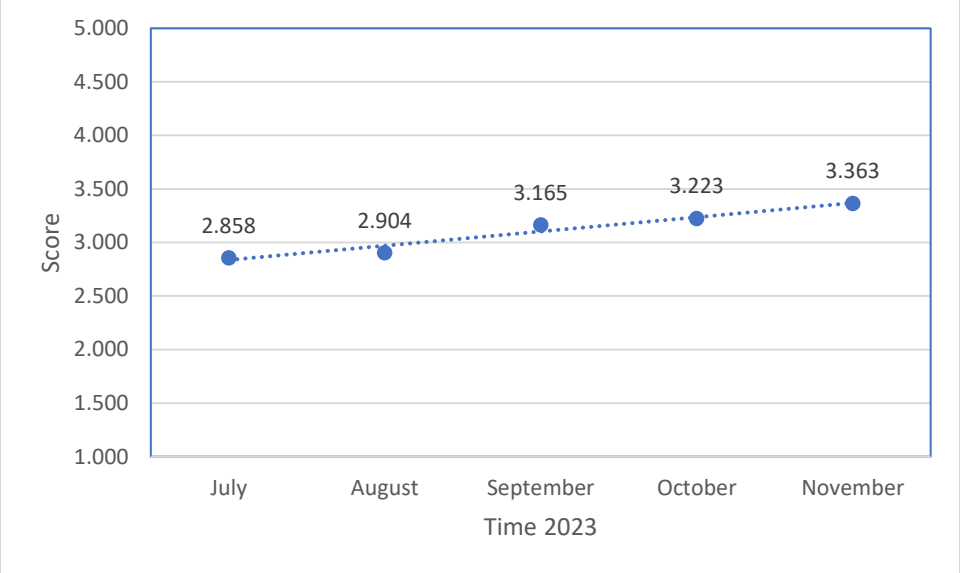
In detail, the steps for operationalizing the model are described as follows (1) Compiling a dissertation draft is carried out by students when registering as prospective students. This is in accordance with the characteristics of education 4.0 for the aspect of "student independence, learning according to student needs and interests". This is in accordance with an idea which states the importance of contextual learning in meeting individual student needs, which emphasizes independent and contextual learning (Anggrenii et al., 2020); (2) Dissertation theme mapping is carried out in the context of providing real and functional courses for students to support the preparation of the dissertation. For study program managers - This step is a real dedication to providing services that are best suited to student needs; (3) The selection of main and supporting subjects is in accordance with learning that meets the needs of students' interests and abilities. This aspect of implementing lectures through coursework and research is in accordance with students' individual learning styles, as well as flexible learning styles. The idea that the selection of main and supporting subjects must be in accordance with the needs of students' interests and abilities, as well as the implementation of lectures through coursework and research that suit individual learning styles, is in line with the opinion of (Ma et al., 2021). This study emphasizes the importance of understanding students' motivations and needs in course selection to develop more personalized and effective course recommendation systems. In their study, it was found that students highly valued the course content and its benefits for their future careers, in addition to being influenced by other factors such as the likelihood of getting high grades, lecturer popularity, and recommendations from peers. These results support the idea that a more individualized and student-focused approach to education can help in designing educational systems that are more effective and meet the specific needs of students; (4) Preparing a dissertation is the final step in the model operationalization element. The aspect that really gets attention in

preparing a dissertation is the usefulness of the results and the contribution to adding to the scientific knowledge of basic education.

The Effect of the Model on the "Time" of Completion of Student Studies

Hypothetically, the model is declared good, but the operationalization of the model really needs to be tested as well. The variable determined as a result of the trial was the effect of the model "timely completion of studies" for students who were subjected to this model. The score contained in this variable is not an absolute score, but a trend score. The results of data analysis for the effect of implementing the model on students' study completion tendencies are described in graph 1 below.

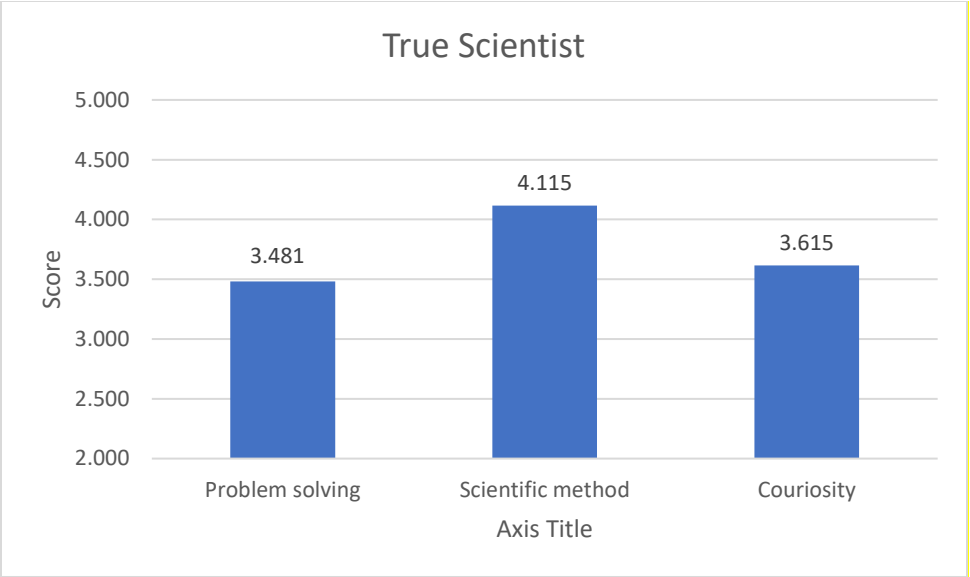
Based on the results of data analysis, it can be seen that the model has a positive effect on the variable effect of completing student studies. Even though this model was tested for a relatively short period of four months, the trend of increasing the time variable for completing student studies was clearly visible. There was no score that decreased from this variable. The increase was from a score of 2,858 to 3,363 over 4 months. An increase of 505 points. If this trend is achieved then the results of this research can hypothesize that the model has a strong effect on the completion of student studies in doctoral programs.



Graphic 1. *The Effect of the Model on the "Time" of Completion of Student Studies*

The Impact of Models in Building the Mentality of Real Scientists

Based on the results of data analysis, the impact of the model on real scientists can be seen in graph 2 below. The scientific method aspect is the highest aspect, followed by the couriosity aspect and the problem solving aspect (Ulfa, 2018). Argues that a true scientist has outstanding abilities in thinking and behaving scientifically. A true scientist also has a mental curiosity towards good science, according to opinion (Surajiyo, 2018). Problem solving ability is an indicator of a true scientist. According to indicators of a true scientist, one of them is problem solving ability (Bariyyah, 2021).



Graphic 2. *The Impact of Models in Building the Mentality of Real Scientists*

The articles collectively highlight the crucial role of integrating modern technologies and active learning strategies in education. They emphasize the importance of developing complex thinking and problem-solving skills in students, essential for addressing real-world challenges. This approach, fostered through interactive, technology-enhanced experiences, prepares students for the demands of the 21st-century workplace, stressing the need for educational methods that go beyond traditional learning paradigms. (Kim et al., 2018; Patiño et al., 2023). In the realm of modern education, the integration of science, technology, engineering, arts, and mathematics (STEAM) has emerged as a vital pedagogical approach. This interdisciplinary framework not only emphasizes the traditional STEM subjects but also incorporates the arts, fostering a more holistic and creative learning experience. The inclusion of arts in the STEAM approach enriches the educational landscape by enhancing creativity and innovation. It acknowledges the evolving needs of a technologically advanced society, preparing students with a diverse set of skills that are essential in navigating and contributing to a rapidly changing world. The STEAM methodology, therefore, represents a significant shift in educational strategies, aligning with the dynamic and integrated nature of knowledge in the 21st century. (Marín-Marín et al., 2021). Curiosity plays a pivotal role in modern education, driving both innovation and learner engagement. It serves as a catalyst for exploration and discovery, preparing the brain for effective learning and making the educational process more enjoyable and rewarding. While Education 4.0 introduces technological advancements and disruptive trends in higher education, it is essential to recognize that curiosity, as a timeless human trait, significantly contributes to academic achievement. Cultivating curiosity in the classroom through methods like surprise, storytelling, and problem-solving activities is crucial for fostering an environment where learners are motivated to seek knowledge and find answers to their questions. This innate curiosity, combined with the innovations of Education 4.0, shapes a dynamic educational landscape aimed at promoting sustainable open education for higher education institutions and advancing the United Nations' sustainable development goals (Chaka, 2022); von Stumm et al., 2011)

CONCLUSION

The philosophical foundation that "Nature & Technology continues to develop" and that currently life on earth is in an era of disruption needs to be reviewed in the context of developing the CW+R curriculum model in the doctoral program for Elementary School Teacher Education at Sunan Kalijaga State Islamic University, Yogyakarta. This model, a curriculum that combines coursework and research, shows significant potential in adapting and responding to the challenges of Education 4.0. Although the initial evaluation shows a positive trend related to study completion time and the development of a true scientist's mentality in students, further

research is still needed to ensure the effective application of this model in educational practice. Reviewing the philosophical aspects of the model being developed is important, to ensure that the CW+R curriculum remains relevant and responsive to rapidly changing educational dynamics. More in-depth research on the CW+R curriculum also needs to be carried out to maintain a balance between theoretical scientific aspects and future educational applications. It is important that there is training for teachers about education 4.0

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Open Data, Ethics And Conflict Of Interest Statement

The authors declare no conflict of interest

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