

HIGHER EDUCATION RESEARCH AND THE GROWING ARTEFACT REVOLUTION 4.0

Riko¹, Iis Dewi Lestari²

Program Studi Informatika, Universitas Indraprasta PGRI, Jakarta ^{1,2}
riko@unindra.ac.id ¹, iisdewilestari@unindra.ac.id ²

Abstract

This article attempts to investigate the possibilities of higher education research to response the challenge from the growing artefact Revolution 4.0. This is the investigation of philosophy of science which is meant to argue that the higher education is the place where philosophical and scientific research as the main priority, but not technology. This consideration should be advanced since technology can fulfil themselves, while philosophy and science require a special place to grow, that is, within the higher education. By nurturing the philosophical and scientific research within higher education, the growing artefact Revolution 4.0 can be anticipated for the benefit of humankind argumentatively.

Keywords: Revolution 4.0, Philosophy of Science, Research, Higher Education, Technology

INTRODUCTION

Of all the history of scientific research, there are three main ideas about how science works. The first is through the work of empirical research, which recognises that each individual researchers has the authority to claim the truth of his or her scientific investigations.

The second idea is the authority of mathematics to claim such truth in scientific research. And, the third, is the role of scientific *communities* to advance the progress in a scientific program.

In the mid-seventeenth century, the role of scientific research in universities (higher education) has somewhat been questioned. The conservative character of the universities' scientific program has driven scientist to set up their own scientific societies. This society is meant to break through the monopoly of universities as the dominant source of scientific progress.

By surveying the progress of how science works, we can advance further questions: where does technology takes place? Does it exclusively belong to themselves or share it to science? These questions are important to underline since

the history of science is apparently separated from technology. This question also implies that one cannot confuse with the nature of philosophical, scientific, and technological research.

It is always important to reveal both scientific and technological realm in order to get clearer ideas of what to expect from higher education research. We can, of course, have another route to abandon those paths. But that abandon would only make the vision about the role of research in higher education be misleading, especially when responding the challenge from the Revolution 4.0.

Before going further, I have to indicate that this article is a philosophy of science investigation. I chose this field because the theme of this call for paper is closer to philosophical than the scientific or technological.

This seminar attempts to invite the view about the role of research in higher education. This implies that the discussion is beyond the investigations of science or technology in particular. Science and technology is busy with their own business to take care of pursuing the particular explanation of a phenomenon

and the pragmatic aspect of the artefacts. In the meantime, philosophy of science concerns with the investigation of scientific research, which is beyond the particular investigations of science and technology.

Now, let us turn to central research problem I would like to propose here. Given that higher education is the place to nurture the philosophical and scientific progress, how can it be relevant to answer the challenge from the practical issues in technology, especially from the growing artefact Revolution 4.0?

The aims of this paper is to investigate the possibilities of higher education research to answer the challenge of Revolution 4.0. I would argue that higher education is the place where philosophical and scientific enquiries nurtures their progress in order to keep their roles as the tools of seeking description and explanation of the dynamic phase of human evolution. I insist that the higher education should strengthen its position in philosophical and scientific enquiries since technology (artefact) can be practised everywhere.

This article will be divided into five sections. The first is the introduction; the second, describing the method; the third, describing how the science works; the fourth, analysing the intersection between science and technology; the fifth, the conclusion, elaborating the research in higher education with the challenge of Revolution 4.0.

METHODS

In this article, I am using literature studies, conceptual analysis and synthesis, and philosophical arguments.

HOW SCIENCE WORKS

In this section, I will argue that science is not an expansive system of knowledge enquiry, and should be seen as an investigation to limited or specific to

only empirical phenomenon. Therefore, the appropriate attitude is not by being superior to other kind of modes of knowledge enquiry. Instead, science must not interfere or stay away from any research or investigations of the unobservational evidence. This partial thesis statement will answer a part of the central thesis statement of this article that science is an important impetus at higher education.

I must first clarify why I should address the concept of “expansive” within my thesis statement in this section.

In so far as science means to describe and explain the observational evidence, the business of science is nothing but to present the perceivable external world systematically to human cognition. This leads us to a neutral realm of science, and therefore, no interest of whatsoever we can attach to.

Unfortunately, the science itself is under "control" of an individual of a group of scientists. While this is not necessarily negative or bad value, but the unpredicted excess is somehow quite apprehensive. In this respect, Hull's finding about the relationship between the scientist and the science is interesting to note. Hull argues that there are complex intersection between the interest of the individual scientist, on the one hand, and the ambition of science, on the other [1]. There are tendencies among scientists to give credit to each other in order to gain recognition.

Whether any connection or not between Hull's finding and the tendency of research activities in Indonesia, I learned that some Indonesian academics seems to be suffered from the solid comprehension of how science works. Some strongly believe that what is called “research”, or “penelitian” in Bahasa Indonesia, must be in the form of empirical investigations. What is not

empirical investigation is not a research activity.

This incommensurable definition of research has discredited those who work in the field of philosophy, mathematics, or technology. Three of those disciplines are not working based on the empirical or observational evidence. But, to call their intellectual works as non-research activity is misleading. Maintaining this misleadingness will only drive the stagnancy of academic works or productivities. So, science cannot monopolise the definition of research for their own works. In fact, science must not interfere the business of investigations of the unobservational evidence. Once we have agreed that science must go on that direction, there is no reason for Indonesian scientists to expand their empirical tradition in doing research to other fields of disciplines.

I have sketched the concept of "expansive", and now I turn to describe how science works. In spite of the rigorous character attached to this kind of knowledge enquiry, I must say that this is also within the debatable area.

There are at least three philosophical theories about science [2]: 1) any effort to analyse or to cope with issues which is based on intelligible evidence; 2) the practice is found in any part of the world; and, 3) cultural phenomenon in a restricted space and time.

From those three theories about science, we can see that the notion about science is varied. We can see it here that the nature of science is debatable.

Science works in three notions, that is, empiricism, the inclusion of mathematics, and scientific communities.

Empiricism believes that the legitimate source of knowledge is experience. It presupposes that the external world independently existed. So, the investigations must directly be pointed to the intelligible evidence. The problem with this sort of investigation is

that the success of the research will not always be guaranteed since many aspects of the elements interfere the result. So, the conformity between scientists is rather vague.

The second notion of how science works is the inclusion of mathematics. The mathematics pattern is adopted in order to make the empirical research to be more special than the everyday observation. But, this adoption is not always worthy. Darwin's work in the *On the Origin of the Species* do not rely on mathematical patterns.

The third part is scientific communities. Shapin argues that the empiricism seems to be unaware that not every individual can examine the hypothesis all alone for himself just because they no longer trust the authority [3]. Acquiring knowledge this way would only be an illusion for everyday knowledge, not to mention for the case of science. For Shapin, empiricism lacks the trust issue that may arise when it comes to convince other parties. Scientists must confirm with one another in order to proceed the progress of the development of science. In short, there is trust and cooperation among scientists that needs to be maintained.

Today, scientists enjoy the facilities brought by social networking services, where they can communicate not only to other scientists but also to everyone online. This technology can give them a hand to disseminate their findings and receive a response from everyone. Notwithstanding, the community conformity among scientists should not hinder individual credit and recognition.

I have described how science works and revealed that within the science itself that this area is not as fixed as it seems. They are dynamic and quite busy with themselves. Therefore, I sum up that science can not be an expansive enterprise since it has homework that

needs to be accomplished, and should not interfere with or stay away from any research or investigations of the unobservational evidence.

SCIENCE AND TECHNOLOGY IN QUESTIONS

In this section, I will argue that there should be a fair treatment between science and technology since both have different direction on its aims. Overlapping between the two will only make each field be distracting to each other.

Together with philosophy and mathematics, technology is actually not under the category of science. Yes, technology is not a science. The category holds by technology also share with philosophy and mathematics. Mathematics is a formal discipline. It is called "formal" because mathematics does not count on empirical evidence, but the mathematical symbol is manifested through numbers. This manifestation is a kind of denoting the abstract existence of the mathematical symbol within head to come to a perceivable substance, that is, *form*. Therefore, mathematics is called formal discipline, the abstract knowledge within head which is shaped by giving it a form, that is, numbers.

Nevertheless, Technology, together with philosophy and mathematics, has a different faith within the Indonesian education atmosphere. Mathematics, while assumed difficult disciplines to study, is taught throughout elementary school to higher education. While technology is also welcoming very happily within Indonesian education. Philosophy, unfortunately, is less welcomed in Indonesia.

I notice that science and technology have somehow been treatment as a pair. In fact, they both are opposite to each other.

Science is an attempt to describe and explain any observable evidence and

phenomenon. It suggests to answer the curiosity of the human being about what is going on with the world outside their existence. Human needs to get a clue about what to expect about the external world. This where science ends.

Technology is taking care of another business. They do not care about what is going on in the world outside them. What they really achieve is that how they could do something easily to finish human activities. They might need help from science or mathematics, but it depends on the degree of sophisticated tools they are making, not an absolute prerequisite. It is the usefulness that matters, not the description or explanation about what is going on in the world.

Together with art (music, painting, dance), technology share same methods: they both trying to imitate nature [4]. We learn from Ancient Greece the distinction between *physis* and *poësis*. *Physis* means nature, something comes to exist on their own without any intervention from anything or anyone. The Greek believes that the nature exist by itself. *Poësis* means artefact, something made or created by human being and can only come to existence with the intervention of human creativity. The sample of *poësis* are art, craft, and social convention.

Ancient Greece word "techne" is related to *poësis*. It means the knowledge or discipline in order to make the *poësis* come into existence. Each techne include the objective and the meaning of the artefact. In Western language, the "techne" is now known as technique and technology [5].

From this point, we can get a clearer idea that for technology the focus is not to understand the nature, but to cope with it and for the immediate benefit of human interest. With this sharp differences, science and technology have their own special places which can not be overlapping.

WHAT TO RESEARCH?

I have discussed how science works and the position of technology. In this section, as the conclusion, I will pronounce that higher education should maintain scientific and philosophical research in order to answer the challenge from the Revolution 4.0.

Technology is practical knowledge and can be developed elsewhere. The rapid development of the growing artefact Revolution 4.0 outside academia is the proof how it requires free spaces of expression.

This does not suggest that higher education to be allergic to this growing artefact. But, to make it a new idol which replaces the scientific and philosophical discipline within higher education is not the best option. The key argumentation is that human being still need to comprehend the world outside them, including to describe and explain the essence and existence of Revolution 4.0 for the benefit of human being.

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