

Integrating Tinkering and Thinkering: an Effort to Break Practical Learning Myths

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Abstract: *This study describes the myth of practical learning in vocational school (VS) which is considered as a complement to learning activities. To break this myth, it requires a new perspective in understanding practical learning. Practical learning that combines tinkering and thinkering is expected to break the myth that has been going on for years. This study uses the Delphi method to summarize the results of studies by experts or previous researchers who have expertise related to the issues discussed, namely the myths of practical learning in VS. The opinions of experts or previous researchers are then used by researchers as a basis for making critical studies. The study revealed that practical learning can develop skills, expertise, proficiency that will lead graduates to become prospective workers at the employability level. Practical learning will also strengthen various soft skills that are needed by the world of work, such as: persistence in carrying out activities, never giving up, results-oriented, proactive, resilience, communicative, the ability to work in teams, and encouragement to continually update skills and expertise in harmony with the demands of the working world. Through practical learning, the students do not only memorize and understand concepts; but they will be conditioned to apply concepts, analyze practical activities, synthesis and evaluate the activities done. Thus, practical learning will familiarize students with high-order thinking. Practical learning is considered very effective in strengthening the spirit of tinkering and thinking of students in order to prepare candidates for employability-level workers. Practical learning will be able to deliver students as prospective workers who are not only smart, but also agile. This study recommends that practical learning is used as the main learning approach in VS, so that students are accustomed to be tinkering as well as thinkering so that they become candidates for employability level worker.*

Key words: *practical learning, tinkering, thinkering, employability*

Introduction

Vocational High Schools (SMK) have the main mission of preparing students to be ready for work, continue their education at university, or manage a business. Presidential Instruction Number 9 of 2016 on Revitalization of Vocational High Schools is intended to strengthen Vocational High Schools to be able to answer the challenges of the world of work. Vocational High School graduates are expected to be ready to work and become entrepreneurs. However, in reality; the open unemployment rate is mostly contributed by Vocational High School graduates.

The Presidential Instruction on revitalizing vocational schools shows the strategic role of vocational schools in strengthening the employment sector to support economic growth. The government is aware that the majority of the workforce in Indonesia is a group of high school and vocational school graduates. The latest data shows that the number of high school graduates in the workforce has reached 31% of the total workforce of 137.9 million people (BPS, 2020). Therefore, the government hopes that vocational schools will be able to play a maximum role in preparing prospective skilled workers.

Vocational schools are encouraged to equip students with various technical skills and reliable work skills. In principle, the revitalization program is also intended to strengthen the

role of vocational schools in preparing students to be ready for work and become entrepreneurs. Unfortunately, the government's hope that vocational school graduates will be the main providers of skilled labor faces many challenges. Data released by the Central Statistics Agency in the last three years shows that vocational school graduates are the largest contributors to the open unemployment rate. The latest data published by the Central Statistics Agency as of February 2020 also shows that the absorption of the workforce aged 15-19 years (vocational high school graduates are in this group) was 78.68%, thus contributing to open unemployment of 21.32% (BPS, 2020).

Educational and learning activities carried out in vocational schools are actually required to have high relevance to the world of work. Educational and learning activities carried out in vocational schools are actually required to have high relevance to the world of work. For that, learning activities in vocational schools should be more in the form of practical learning. The revitalization program requires vocational schools to implement teaching factories so that students understand the world of work.

This study aims to uncover a latent problem in vocational schools. Most people assume that learning is indicated by thinking activities. Therefore, there is an assumption or myth that practical learning activities in vocational schools are considered complementary. This is what is called the myth of practical learning. Previous research conducted by Claxton, et al. (2010) revealed that practical learning makes a major contribution to providing experience and work skills for vocational school students (Claxton et al., 2010). However, previous study revealed that many parents of vocational school students are less supportive when their children learn to produce and sell, because they consider practical activities not part of the main learning activities. In addition, the results of the study also revealed that some vocational school teachers are less supportive of practical activities because these activities are considered to cause noise and interfere with learning activities in the classroom (Prianto et al., 2021).

This study examines the myths of practical activities that hinder the effectiveness of the revitalization program of vocational schools in preparing prospective graduates who are ready to work. This study aims to criticize various myths of practical learning. Furthermore, this study offers a concept of learning and teaching in vocational schools that combines tinkering and thinking activities. The advantages of combining tinkering and thinking activities in preparing prospective vocational school graduates who are ready to work are discussed in the final section.

Methods

This study uses an exploratory descriptive approach to provide a critical review of the views, perceptions, or beliefs of the community about the myth of practical learning. This study uses the Delphi method to summarize the results of research from experts or previous researchers related to the issue discussed, namely the myth of practical activities in vocational high schools (Prianto et al., 2021; Sunarto, 1994). The opinions of experts and previous researchers are then used by researchers as a basis for making critical reviews. The results of research from experts or previous researchers used as references to make critical reviews are: (Brandsford et al., 1999; Brewer, 2013; Bronowsky, 1973; Caballero et al., 2011; Carr et al., 2015; Casner-Lotto & Barrington, 2006; Clark & Winch, 2007; Claxton et al., 2010; Dey Bose, 2021; Entwistle, 2010; Fantinelli et al., 2024; Ferrandez-BerruecoReina et al., 2016; Grubb & Ryan, 1999; Kehoe, 2007; Prianto et al., 2021, 2022; Riyad et al., 2020; Saehu et al., 2020; Sarita & Malik, 2023; Singh, 2021).

This study will describe several issues related to practical learning. The various issues presented in this study were collected from the results of interviews and opinions regarding

tinkering and thinkering, learning activities carried out by vocational school graduates who have succeeded in developing their careers as workers or entrepreneurs, as a result of their consistency in continuing to develop skills, expertise, and abilities. The various issues presented by considering the critical review of researchers based on various opinions of experts and previous researchers. In principle, this study is intended to break the myth that states that practical activities are a complement to teaching and learning activities because they take place more in the classroom.

Results and Discussion

Article 15 of Law Number 20 of 2003 concerning the National Education System states that the purpose of vocational secondary education is to prepare students to become productive people, work independently, fill job vacancies in the job market as skilled workers with their competencies. Vocational secondary education aims to produce students who will later become graduates who are ready to work, have an entrepreneurial spirit, think intelligently, and are competitive, so that they are able to compete in the job market. To fulfill the mandate of the Law, educational and learning activities in vocational high schools must emphasize more on practical activities, whether carried out in class, in workshops, school business units, or through internships in companies and industries.

The effectiveness of the implementation of practical learning depends on the quality of practice-based learning activities supported by the availability of various workshop equipment and functional laboratory equipment to strengthen students' understanding of the subject matter and skills. In addition, the presence of qualified and competent teachers, technicians, supervisors, tutors, student activeness in the teaching and learning process, and various facilities and infrastructure that support the achievement of learning objectives are needed (Prianto et al., 2021).

Various findings on learning activities in vocational high schools indicate that practical learning, both held in schools and outside schools, has not fully become the main learning activity, especially for vocational schools of business and management (Fantinelli et al., 2024; Prianto et al., 2022; Saehu et al., 2020). This is due to limited supporting facilities and infrastructure for practical learning, such as workshops and laboratories, a lack of productive teachers, and a lack of technicians as mentors. Cooperation between schools, companies and industries is more in the form of memorandums of understanding (MoU) and has not been followed up to the aspect of implementing the agreement (IA). This causes business and industry circles not to be intensively involved in learning activities.

Various studies have revealed that practical learning, as the main learning activity, has not been implemented intensively (Prianto et al., 2021). In fact, various studies have proven that if practical learning is implemented intensively, students will master the knowledge, skills, and work experience as prerequisites for applying for jobs (Saehu et al., 2020; Sarita & Malik, 2023; Singh, 2021). The results of previous studies revealed that the learning culture and perspectives of parents, some teachers, and students towards practical-based learning activities revealed that practical learning has not been positioned as the main learning activity. This is what causes practical learning activities in vocational high schools, both those implemented in schools and outside schools, not to be implemented optimally. For some parents, teachers, students, and the community; practical activities are not considered as the main learning activities in vocational high schools. Practical learning is considered a complementary learning activity (Prianto et al., 2021).

Practical Learning Myth: Practical learning as a complementary activity in learning

How should we respond to this myth? Is it true that practical learning is a complementary activity in vocational high schools? Is it true that practical learning is more

oriented towards strengthening skills, and does not support strengthening thinking skills? The following explanation is a discussion of the myth of practical learning.

Bronowsky (1973), 50 years ago, wrote a book entitled "The Ascent of Man". In the book he wrote, he stated that "The hand is the cutting edge of the mind". This means that our minds will work well if our hands and all our body parts are actively working. Based on this view, Bronowsky explained the importance of practical learning for vocational high school students (Bronowsky, 1973). In fact, learning activities are not only related to the mind, just as the student's body is not only related to the brain. The mind is actually just one aspect of all body systems (Prianto et al., 2022). To explain this, imagine what a person will do when he suddenly faces a complicated problem. Does he just stay silent, close his eyes, and think about all those complicated things? In addition to thinking, he will certainly be motivated to move his feet, hands, and other body parts that can be involved in solving the problems he faces. This is the importance for students to fill their learning activities, develop thinking skills; and strengthen their ability to act simultaneously.

For decades, learning activities in schools have been dominated by thinking activities, with minimal action activities. Learning activities focus more on strengthening thinking skills, but the body is passive. This has resulted in the presence of a generation that may be intelligent, but not agile. He is smart, able to think about a problem; but he often has difficulty finding a solution to the problem. He may be good at talking, but less agile when he comes to the workplace (Prianto et al., 2021, 2022).

Claxton, et al. (2010) stated that learning activities are not only to develop thinking skills. At the same time, learning is also intended to strengthen the ability to act. In some of his arguments, Claxton, et al. (2010) even emphasized that in certain cases the ability to act must be developed first, because the ability to act actually strengthens the ability to think (Claxton et al., 2010). By considering the views of experts and previous researchers, the following is a critical review of the importance of strengthening practical learning, as the main learning activity in vocational high schools:

1. *The urge to do something is preceding in a person rather than seeing and thinking.*

Thoughts are designed as a provision for someone to take an action. Basically, all humans are actively moving, and not creatures that are more silent and contemplative. When facing problems, humans do not always appear in a linear sequence of activities, starting from pondering, thinking about, deciding what action to take, and then taking action. The process of acting which is linear like this is what makes humans slow to act, and of course this is irrelevant to the tendency of change in a fast-moving society. Because the mind is designed as a provision for action, in fact when a person takes certain actions in facing a problem, at that very moment he actually develops the ability to think (Bronowsky, 1973; Prianto et al., 2021)

Every conscious action will be accompanied by thinking activity. Before we open our eyes, when we wake up in the morning, the sensory system in the body will direct us to "do what", choosing what activities we can do (Abrams et al., 2008). Our minds see an object depending on whether the object is close to our hands or not. If an object is close to the hand, this will allow the mind to describe how far the object can be reached and manipulated as desired. Someone sometimes thinks and assumes that an object is difficult to work on. However, when the hand is able to reach and do something to the object, the mind immediately states that the object is easy to handle (Abrams et al., 2008).

It is the hand that causes the mind to change in viewing an object (Abrams et al., 2008). The mind often causes a person to hesitate, be unsure, and feel unable to carry out the work activity. However, when a person is forced to do a certain job, at that moment all of his body

parts will be involved in the job. At first, a person may feel confused about where to start doing the job. However, at that moment his body parts will move to do the job. And at the same time his mind automatically works according to the rhythm of his body parts' movements (Brandsford et al., 1999; Bronowsky, 1973). Based on this assumption, students who carry out practical learning that involves all of their body parts will automatically trigger the mind to work. In other words, practical learning will sharpen the mind.

2. *Body and mind are closely related.*

Decisions made by a person are not always driven by their thoughts alone. Sometimes a person relies on reflexes or spontaneous behavior when faced with something that must be decided quickly. Of course, spontaneous behavior does not necessarily appear in everyone. A person's experience when involved in a certain field is the main driver of a person's spontaneous behavior when facing an emergency situation. Experience will only be had by a person when he experiences an incident, or he is actively involved in an activity. The more intensive a person's involvement in a field of activity, the stronger the experience a person has in that field (Kehoe, 2007; Prianto et al., 2022).

Experiencing an incident, which is the main form of experience, is a combination of physical activity of the whole body, mind, and emotions or feelings. Kasali (2005) calls it a combination of brain memory (thinking activity) and muscle memory (physical activity) (Kasali, 2005). The combination of brain memory and muscle memory then enriches affective memory (feelings) (Prianto, 2013). Thus, strengthening work skills must be done by strengthening the ability to think, the ability to act, and strengthening sensitivity simultaneously, although these three components do not always work sequentially.

Accumulation of experience allows a person to perform activities reflexively, spontaneously, as if without thinking first. This is what is called agility. The person is able to work quickly, because the muscles of the body and emotions are accustomed to the activities and situations they face. This kind of situation always exists in a professional who is indeed an expert in his field. He works as if without thinking. This is possible because an experienced professional will be able to move brain memory, muscle memory, and affective memory simultaneously. That is why people who are experts in their fields are always able to work quickly (Prianto et al., 2021).

Learning activities aimed at strengthening work skills must provide sufficient opportunities for students to think and act simultaneously. Students will only be able to accumulate experience if they are involved in an event. Students will not be able to act when faced with an event, if they are never actively related to the event. The involvement of students in practical work activities will enable them to develop emotions, feelings, mentality, and work attitudes.

Emotions, feelings, mentality, and work attitudes can be likened to oil that lubricates a person's thoughts and actions while working. He will be able to act flexibly when working; as always shown by professionals who are experts in their fields. Thus, it can be concluded that practical learning will strengthen thinking skills, and culminate in dexterity (Prianto et al., 2021).

3. *The limbs are much smarter than we think*

Common opinion says that a person's quality is determined by their thinking ability or level of intelligence. However, in recent decades this view has been complemented by the theory of multiple intelligences. Education in Indonesia assumes that intelligence is the main focus that must be developed. Therefore, most educational activities are more oriented towards developing academic abilities. Students' academic achievement is measured by written tests, asking students to think about questions and write them on paper. Of course,

this is not wrong, if the goal of education is to strengthen the ability to think, remember, understand, apply, analyze, synthesize, and evaluate. This view of education that focuses on developing the brain or mind is deeply rooted in the education system in Indonesia and various countries in the world (Brandsford et al., 1999; Dey Bose, 2021; Ferrandez-BerruecoReina et al., 2016).

However, it must be admitted that our limbs have much higher intelligence than we think. Just imagine, why are there two people who are physically equal, but their ability to lift weights can be different. We can immediately guess, this is because one has been trained to lift weights, while the other has never received weight training. This means that the absence of weight training causes someone to lose the opportunity to develop the potential strength of the muscles throughout their body (Riyad et al., 2020).

The involvement of all body parts in an activity plays an important role in strengthening a person's understanding of what they are doing. This is in line with the principle of Confucius' teachings: "I hear, then I forget; I see, then I remember; I do, then I understand". To build a deep understanding, all body parts must be involved in learning activities. Of course, we do not invite our feet and hands to think, because thinking is the work of the brain. We train our feet and hands to do an action. Continuous training will make the feet and hands, as well as other body parts, able to "understand better" when their role is needed in certain situations (Saehu et al., 2020).

Let's look at the trained cleaning service staff. Their vision is so sharp, they are able to see soft dust that sticks to the floor. Their trained vision becomes sharp, so they are able to clean the floor quickly. Most of the problems in our lives require handling supported by body movements. Therefore, our body parts also need to be trained to handle the various problems we are facing.

Currently, most of the heavy work routines can be taken over by robots or artificial intelligence devices. The presence of artificial intelligence is actually a response from the mind triggered by the involvement of all our limbs in completing various jobs. Trained limbs trigger the mind to create robotic equipment that can be programmed with a certain work rhythm as previously done by a person through the movement of his limbs in completing work. Therefore, learning activities in schools should provide a balanced portion between strengthening the ability to think and to act (Hubert & Stuart, 1996; Prianto et al., 2021). Mental intelligence is part of the "intelligence" of all limbs that are trained to solve life's problems. This is the importance of practical learning in vocational high schools.

4. Physical movements of the body will strengthen the mind

Physical gestures and body movements have been shown to be important components that strengthen the development of thinking skills and provide quick responses when facing (Casner-Lotto & Barrington, 2006; Claxton et al., 2010; Fantinelli et al., 2024; Ferrandez-BerruecoReina et al., 2016). All of our body parts have a significant influence on mental development. Various studies have shown that children who learn by sitting more, being quiet, and just listening have been shown to be less intelligent than children who act actively, for example by writing what they see (Kehoe, 2007).

Claxton, et al. (2010) stated that students who involve gestures in learning activities have been shown to provide a much stronger understanding than those who learn by sitting, listening, and watching. The involvement of all body parts in learning activities can encourage students to think more freely, and this triggers the growth of creativity (Claxton et al., 2010). Therefore, many creative ideas emerge when someone is taking a shower, on the beach, or while exercising in the morning.

Body movement will not only strengthen students' minds. Even the way students sit affects the development of the mind. Body posture and facial expressions also affect the mind. Students who sit on their backs with a languid facial expression will form an attitude of being less proud of their own work, less sensitive to existing problems, less able to think seriously, and tend not to dare to face problems. These various studies prove the importance of students involving all parts of their bodies when learning. Students should behave actively, and not just sit and be silent. This can be done by encouraging students to practice what they have learned (Goldin-Meadow & Wagner, 2005).

Practical learning plays a major role in producing a workforce with a tinkering mentality, namely a workforce that carries out trials, tinkers, and makes continuous improvements. Practical learning that is carried out intensively allows students to construct understanding and strengthen their intelligence. Various critical reviews as explained show that in essence, practical learning allows students to think more deeply (Prianto et al., 2022).

Practical learning allows students not only to memorize and understand concepts, but also to develop their thinking skills. Through practical learning, students are accustomed to applying concepts, analyzing practical activities, creating systems and evaluating activities carried out. Practical learning strengthens students' high-level thinking skills. Practical learning encourages students to think critically, think using paradigms, and encourage students to use research and development methods to find solutions that are considered more effective and efficient. Thus, practical learning will create prospective workers with a strong level of employability (Prianto et al., 2021).

Conclusion

Based on the results of the critical review, several conclusions can be proposed as follows:

1. Practical learning is a learning activity that is oriented towards strengthening skills, expertise, and abilities that lead graduates to become competitive prospective workers. Practical learning also strengthens various soft skills needed by the job market, such as: persistence in carrying out activities, resilience, results-oriented, proactive, communicative, teamwork, and the ability to update knowledge and skills in line with the job market.
2. Practical learning allows students to understand concepts, apply concepts, analyze practical activities, create systems and evaluate activities that have been carried out. Thus, practical learning allows students to develop high-level thinking skills.
3. Practical learning is very effective in strengthening the spirit of tinkering and thinking of students in order to prepare prospective workers who are able to compete in the job market. Thus, practical learning is an effective learning strategy to prepare students as intelligent, responsive and agile prospective workers.

Based on the conclusions in this study, some suggestions can be proposed as follows:

1. Practical learning should be positioned as the main learning activity in vocational high schools. Therefore, all stakeholders should support the implementation of practical learning in vocational high schools.
2. Parents, entrepreneurs, and industry should understand the urgency of practical learning so that it is carried out intensively in vocational high schools.
3. Evaluation of learning completion in vocational high schools should combine aspects of understanding concepts, the ability to apply concepts, and having positive values and attitudes. This will strengthen learning activities that are oriented towards strengthening high-level thinking skills. This is to prove the jargon of vocational high schools: "SMK Hebat dan BISA! -" Vocational High School is Excellence!"

Reference

- Abrams, R. A., Davoli, C. C., Du, F., Knapp III, W. H., & Paull, D. (2008). Altered vision near the hands. *Cognition*, *107*(3), 1035–1047.
- BPS. (2020, February). Februari 2020: Tingkat Pengangguran Terbuka (TPT) sebesar 4,99 persen. *BPS*. <https://www.bps.go.id/id/pressrelease/2020/05/05/1672/februari-2020--tingkat->
- Brandsford, J. D., Brown, A. L., & Cocking, R. R. (1999). *How people learn: brain, mind, experience and school*. National Academy Press.
- Brewer, L. (2013). *Enhancing youth employability: What? Why? and How? Guide to core work skills*. International Labour Organization.
- Bronowsky, J. (1973). *The Ascent of Man*. BBC Books.
- Caballero, C. L., Walker, A., & Fuller-Tyszkiewicz, M. (2011). The Work Readiness Scale (WRS): Developing a measure to assess work readiness in college graduates. *Journal of Teaching and Learning for Graduate Employability*, *2*(2), 41–54.
- Carr, R., Palmer, S., & Hagel, P. (2015). Active learning: The importance of developing a comprehensive measure. *Active Learning in Higher Education*, *16*(3), 1–14.
- Casner-Lotto, J., & Barrington, L. (2006). Are They really ready to work? Employers' perspectives on the basic knowledge and applied skills of new entrants to the 21st century. *The Conference Board, Inc., the Partnership for 21st Century Skills, Corporate Voices for Working Families, and the Society for Human Resources Management*. <https://eric.ed.gov/?id=ED519465>
- Clark, L., & Winch, C. (2007). *Vocational education international approach, development and system*. Routledge.
- Claxton, G., Lucas, B., & Webster, R. (2010). *Bodies of Knowledge How the learning sciences could transform practical learning and vocational education*. Edge Foundation 2010 10 Golden Square, London.
- Dey Bose, B. (2021). Theoretical education Vs practical education. *International Journal of Literacy and Education*, *1*(2), 149–152.
- Entwistle, H. (2010). Practical and theoretical learning. *British Journal of Educational Studies*, *17*(2), 117–128.
- Fantinelli, S., Cortini, M., Di Fiore, T., Iervese, S., & Galanti, T. (2024). Bridging the Gap between Theoretical Learning and Practical Application: A Qualitative Study in the Italian Educational Context. *Education Sciences*, *14*(198), 1–20.
- Ferrandez-Berruete Reina, Kekale, T., & Devins, D. (2016). A framework for work-based learning: Basic pillars and the interactions between them. *Higher Education Skills and Work-Based Learning*, *6*(1), 35–54.
- Goldin-Meadow, S., & Wagner, S. (2005). How our hands help us learn. *Cognitive Science*, *9*(5), 234–241.
- Grubb, W. N., & Ryan, P. (1999). *The roles of evaluation for vocational education and training: Plain talk on the field of dreams*.
- Hubert, L. D., & Stuart, E. D. (1996). *Mind over Machine: The Power of Human Intuition and Expertise in the Era of the Computer*. Free Press.
- Kasali, R. (2005). *Change*. Gramedia.
- Kehoe, D. (ed). (2007). *Practice Makes Perfect: The Importance of Practical Learning*. The Social Market Foundation.
- Prianto, A. (2013). Berbagai variabel yang mempengaruhi kesiapan bekerja para pencari kerja. *Manajemen USAHAWAN Indonesia*, *42*(3), 219–247.

- Prianto, A., Qomariyah, U. N., & Firman. (2022). Does Student Involvement in Practical Learning Strengthen Deeper Learning Competencies? *International Journal of Learning, Teaching and Educational Research*, 21(2), 211–231.
- Prianto, A., Winardi, & Qomariyah, U. N. (2021). *Memperkuat Pembelajaran Praktik, Mengharap Employabilitas Siswa SMA*. Intelegensia Media.
- Riyad, M., Pramana, C., Munakib, & Maselena, A. (2020). Theoretical Education vs Practical Education. *TEST Engineering & Management, January-Fe*, 5074–5081.
- Saehu, M. S., Sari, R. K., Hafidah, Mahbub, M., & Yuliastuti, E. (2020). The Advantage of Theoretical Education and Practical Education in Modern Society. *Journal of Critical Review*, 7(17), 534–541.
- Sarita, & Malik, K. (2023). Teoritical Education vs practical education. *International Research Journal of Modernization in Engineering Technology and Science*, 5(1), 295–297.
- Singh, P. (2021). Comparing Theoretical Education And Physical Education: An In-Depth Examination. *Ilkogretim Online - Elementary Education Online*, 20(1), 8582–8586.
- Sunarto. (1994). Teknik Delphi Suatu Pendekatan dalam Perencanaan Pendidikan. *Cakrawala Pendidikan*, 2(XIII), 111–122.