

SCHOOL MANAGEMENT: THE OPTIMIZATION OF LEARNING FACILITIES TO IMPROVE THE QUALITY OF VOCATIONAL SCHOOLS

Rahman Setia^{1*}, Dindin Nasrudin²

¹Sekolah Tinggi Agama Islam Sebelas April Sumedang
Jl. Angkrek Situ No. 19, Kotakaler, Sumedang Utara, Sumedang, Jawa Barat 45621, Indonesia

²Universitas Islam Negeri Sunan Gunung Djati Bandung
Jl. A. H. Nasution No. 105, Cibiru, Panyileukan, Kota Bandung, Jawa Barat 40614, Indonesia

Abstract


The creation of qualified graduates is a parameter of the implementation of quality education. Vocational schools become one of the learning places to produce quality human resources who are ready to enter the world of business and industry. Effective and efficient management of learning facilities and infrastructure is a leadership strategy of the school's related parties to improve the quality of graduates. This research uses a qualitative approach with a case-study design. A total of three vocational schools in Sumedang Regency were selected as research sites. This research aims to understand, describe, and analyze the school principals' leadership strategies in managing and developing learning facilities and infrastructure to improve their graduates' quality. The research data were collected through observation, interviews, documentation studies, and field notes. The results show that despite all the problems due to the limited availability of practical equipment and the minimal cost allocated, vocational schools in Sumedang Regency can produce graduates with the industrial world's certified expertise competencies. The use of learning facilities and infrastructure to improve graduates' quality in the three vocational schools participating in the research has been running optimally. However, the strategy for developing learning facilities and infrastructure has not been implemented as expected. Planning, implementation, and supervision are stages that must be highly considered by school principals in managing learning facilities and infrastructure.


Keywords: *school management, leadership strategy, graduate quality, learning facilities, vocational school*

How to cite: Setia, R., & Nasrudin, D. (2020). School management: The optimization of learning facilities to improve the quality of vocational schools. *Jurnal Pendidikan Vokasi*, 10(2), 150-158. doi:<https://doi.org/10.21831/jpv.v10i2.29981>



***Corresponding Author:**

Rahman Setia  rahmansetia@staisebelasapril.ac.id

 Department of Islamic Religion Education, Sekolah Tinggi Agama Islam Sebelas April Sumedang
Jl. Angkrek Situ No. 19, Kotakaler, Sumedang Utara, Sumedang, Jawa Barat 45621, Indonesia

INTRODUCTION

Development in the field of education is one of the most strategic steps to increase the quantity and quality of human resources. Empirically, the progress in the field of education in a country has a positive correlation with the increase in the welfare of its citizens. The development of education that is well organized and appropriate will produce an intelligent, competent, productive and competitive society so that it can be the backbone of the social, political, and economic development of a nation. Education in Indonesia as stated in the Law of Republic of Indonesia No. 20 of 2003 concerning National Education System article 13 is divided into three main pathways, namely formal, informal and non-formal education. One part of formal education that contributes to creating quality human resources is vocational education.

Vocational education can be defined from various perspectives. In the school perspective, vocational education teaches how a person can work effectively. Thus, vocational education takes place when an individual or some get information, understanding, abilities, skills, appreciation, interests and or attitudes that enable him to start or continue a productive activity. In vocational education, students are prepared to become professional workers or to continue their education to a higher level (Djojonegoro, 1998; Hamalik, 1990).

In general, vocational education is part of education that makes a person more "employable" in a work group (Evans, 1978). There are several characteristics of vocational education, among others are preparing graduates who can be marketed in the world of work and have the ability to adapt to industrial development, have workshops and laboratories as the main equipment in the learning process that can reflect the world of work situation realistically and educatively, and have cooperative relations with business and industry as a means of synchronizing vocational education programs with the demands of the world of business and industry (Young, 2004). The success of vocational education can be seen from two criteria: the success of students in school (in-school success) and outside of school (out-of school success). The first criterion includes the success of students in meeting curricular requirements, while the second criterion is shown by the success or performance of graduates after being in the real and actual world of work (Idrus & Arviana, 2018).

In connection with the quality of graduates, vocational high schools (*sekolah menengah kejuruan* or SMK) are mandated by the law to prepare human resources who are ready to enter the world of work and become productive workers. This is explained in the explanation of Law of Republic of Indonesia No. 20 of 2003 concerning National Education System article 15 that vocational education is secondary education that prepares students, especially to work in certain fields. Thus, SMK graduates should ideally be quality workers in terms of quality and ready to work directly in the world of business and industry. The quality of graduates here includes several dimensions, namely tangible, empathy, responsiveness, reliability, and assurance (Ilyas, 2004).

Qualified graduates are the output of quality education. Quality education is education that is able to carry out the process of maturation of the quality of students developed by freeing students from ignorance, incapacity, helplessness, untruthfulness, dishonesty, and bad morals and faiths (Mulyasana, 2011). The quality of education is the achievement obtained by the students after completing their studies stated in the form of test scores or learning evaluation scores.

The quality of education with a relative definition has two aspects, namely the measurement of meeting the needs and demands of customers which include parents of students and the community and the measurement of the skills of the graduates in accordance with the school goals set in the curriculum (Nurjaman, 2011). At vocational schools, the curriculum is developed and implemented using a competency-based approach so the assessment of learning outcomes uses a competency-based assessment method. This relative definition of graduate quality and educational quality has implications for management and curriculum in vocational high schools.

Vocational high schools must be managed with reference to the main goal, which is to prepare graduates who are ready to enter the world of work. Vocational management must be designed by considering the effectiveness and efficiency (Hasibuan, 2006; Terry & Rue, 2005; Umar, 2003). The curriculum must also be arranged based on the needs of the world of work. Workshops and laboratories must be provided with the same criteria or at least close to the world of work. This really needs to be a major concern because in practical activities, facilities are a good primary

learning resource which, if used properly, can help explain something so that information conveyed through practical activities will become clearer (Bafadal, 2004; Department of Education and Culture, 1981; Wotto, 2000). Therefore, the learning process in vocational schools must be carried out in such a way that graduates are truly prepared to enter the workforce, in the sense of having the knowledge, skills and attitudes needed in the world of work.

The learning process is a humane interaction between teachers and students who are laden with uncertainty. One factor that causes this major uncertainty is school culture, influenced by leadership styles. Figure 1 shows a chart that explains the role of leadership styles in generating school culture in improving the quality of the Organizing School for Excellency model (Zamroni, 2007).

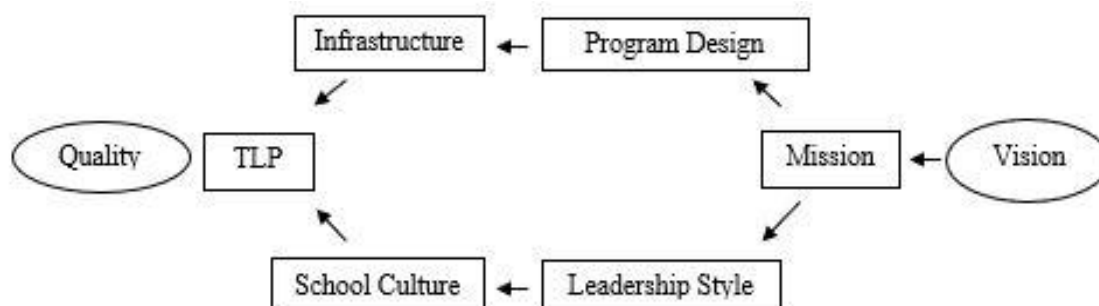


Figure 1. Organizing School for Excellency

The school principal as the top leader in the school has a vital role in a series of school planning, implementation and management activities, including learning facilities and infrastructure. A school principal should implement leadership strategies that are appropriate, effective, and efficient in order to achieve the vision and mission of the school and the creation of qualified graduates.

Based on observations and interviews at a number of vocational schools in Sumedang Regency related to the management of learning facilities and infrastructure, it is known that there are limited numbers of practicum equipment, minimal costs allocated to support practicum activities that require relatively large budgets, and a learning environment that is far from resembling the conditions of the world of work. When compared with other regions in West Java, the practical equipment owned by vocational schools in Sumedang is still far behind.

This research aims to understand, describe, and analyze the leadership strategies of school principals in several vocational schools in Sumedang Regency in managing learning facilities and infrastructure to improve the quality of their graduates. Several similar researches have been conducted before (Indiana, 2005; Taryana, 2011; Taufik, 2011). Teachers also play a role in improving the quality of students through optimizing the use of available learning facilities and infrastructure (Indiana, 2005). In addition, improving student learning outcomes is strongly influenced by the strategic management applied by the schools in developing learning facilities and infrastructure (Taryana, 2011).

The implementation of management of learning facilities and infrastructure requires the involvement of the whole school elements. If one of the elements does not function in accordance with its responsibilities, this will result in the suboptimal goal of the implementation of learning facilities and infrastructure management, which is, to improve the quality of learning (Taufik, 2011). Different from previous researches, the present research chooses vocational high schools as a place of research and specifically establishes three elements of school leadership which include school principal, vice principal in infrastructure, and the head of machinery engineering expertise program as the main subject.

RESEARCH METHOD

This research uses a qualitative approach with a case-study design. Case study was chosen as the research design because it is a design that aims to understand, describe, and analyze in detail and in depth the object being studied. The focus of this research is to understand, describe, and analyze in depth about the leadership strategies implemented by school principals in managing

learning facilities and infrastructure as an effort to improve the quality of vocational school graduates in Sumedang Regency. In this study the principal acted as the research subject

A total of three vocational schools in Sumedang Regency that have the machinery engineering expertise programs were selected as research sites, consisting of two private vocational schools and one public vocational school. In detail, the purpose of this research is to understand, describe, and analyze (1) how the school principal's leadership strategy in managing learning facilities and infrastructure, (2) what obstacles arise in the management of the learning facilities and infrastructure, and (3) what are the efforts made by schools in overcoming obstacles that arise in managing learning facilities and infrastructure.

In addition to the researcher as the main instrument, the research data were also obtained through observations, interviews, documentation studies, and field notes. Various data collection techniques are used in an attempt to obtain valid data. The results of the interviews are compared with the data obtained from observations and available documents, thus the data will provide valid conclusions after passing the triangulation stage. The interview with the school principal aims to dig deeper information related to his strategy in improving the quality of graduates through the management of learning facilities and infrastructure.

Documentation studies were carried out on documents relating to the implementation of strategies for managing vocational practical facilities and infrastructure, including (1) regulations, provisions, decisions and policies relating to the management of facilities and infrastructure for vocational practices to improve the quality of learning, and (2) physical evidence regarding the management of vocational practical facilities and infrastructure.

RESULTS AND DISCUSSION

The differences in the school principal's strategies in managing the learning facilities and infrastructure at the vocational schools studied are due to differences in strengths, weaknesses, opportunities and challenges faced by each of them. The differences are also caused by the differences in the ability of the school principals as the leaders as well as other school personnel who are responsible for the progress of student learning.

In terms of management, the school principals have divided the tasks and delegated authority to the head of the expertise competency (productive teacher) in the application of the process of managing learning infrastructure or practical facilities. Thus, the management of practical facilities is handled by teachers who have competence in their fields. From the Study of School Activity Budget Plan (*rencana kegiatan dan anggaran sekolah* or RAKS), it is known that funding sources in vocational schools are obtained from the government and parents of students. The existence of quality management operational assistance from the central government aimed at improving the quality of learning in vocational schools has also helped the availability of teaching materials supporting practice in the teaching and learning process.

Based on the data obtained by the researcher, a number of school principals' strategies and other school leadership elements can be formulated in the management of learning facilities and infrastructure to improve the quality of school graduates. These strategies can be seen in Table 1.

Table 1. School Principal's Leadership Strategies in Managing Learning Facilities and Infrastructure

No.	Strategies
1	Developing quality management of practical facilities and infrastructure by increasing the number of practical facilities to meet the Minimum Service Standards (SPM).
2	Improving the quality of human resources and management of facilities and infrastructure for vocational practices.
3	Optimizing the use of vocational teachers in the procurement and maintenance of practical facilities.
4	Optimizing the use of practical facilities owned by schools.
5	Monitoring the learning process in the workshop.
6	Evaluating and revamping the performance that has been carried out.
7	Strengthening the network of cooperation with stakeholders to develop workshops.

In implementing the strategy that had been formulated by school leaders in order to improve the quality of their school graduates, several obstacles were also found. Table 2 presents the obstacles experienced by schools in the management of learning facilities and infrastructure.

Table 2. Obstacles in the Management of Learning Facilities and Infrastructure

No.	Obstacles	Impacts
1	The lack of funds that can be realized by the school to the competency, in other words the realized funds are smaller than those proposed.	Delays in the process of procurement, use, maintenance and repair. This situation also causes not all competencies that exist in machinery engineering expertise can be fully equipped.
2	Funds allocated, both from parents and quality management operational assistance from the government cannot meet the needs in accordance with curriculum demands.	Meeting the needs of practical tools and materials is an obstacle because the needs of tools and materials for each expertise competency are different.
3	The number of machines needed is limited.	The emergence of damage due to the limited number of machines that causes more hours of use, which leads to the faster level of wear and frequent mild and severe accidents.
4	Lack of funding owned by schools or foundations (private schools) for maintenance.	Not having special technical personnel in the repair and maintenance of practical facilities.

In an effort to overcome the obstacles that arise in the management of learning facilities and infrastructure in order to improve the quality of school graduates, the vocational school principals in Sumedang Regency do several things that can be seen in Table 3.

Table 3. Efforts to Overcome Obstacles in the Management of Learning Facilities and Infrastructure

No.	Obstacles	Solutions
1	Availability of main equipment (machinery) and supporting equipment	<ul style="list-style-type: none"> a. In the procurement of the main equipment in the form of machines by requesting assistance to the central government, in this case the Directorate of Vocational Development b. Requesting for assistance in the form of grants from the world of business industry c. Collaborating with the Bank to get a machine purchase credit
2	No practical tools and materials	For the upcoming school year, the procurement of tools and materials through purchases is made by the Shopping Team formed by the school principal
3	Overcoming the use of workshop facilities	With an insufficient number of teachers (private vocational schools) where one group is handled by one teacher, the teacher or the head of expertise competency provides guidance to several students who have a prominent ability to help the teacher become a mentor to their peers
4	Overcoming the lack of funds in the procurement, maintenance and repair of practical tools and materials.	To overcome the lack of funds received by expertise competencies, the school through the production unit in the workshop serves the community or industry that utilizes vocational workshops (production unit) in the manufacture of spare parts or construction work (welding). Although it is felt to be able to cope with funds, in its development obstacles in the form of very few or not routine orders from the user are still faced.

In the transformational theory, the school principal must act as an agent of reform that can transform optimally all school resources, including leadership staff, teachers, administrative staff, students, facilities, funds, and external factors in the school in order to achieve meaningful goals in accordance with the target which has been determined in the development of learning facilities and infrastructure (Kwan, 2020; Permadi & Arifin, 2007). The school principal's leadership is observed

by referring to the four dimensions of leadership (Kruse, 2017; Stein et al., 2016; Sudha et al., 2016). First, the school principal is an idealized influence, which makes his followers admire, respect, and at the same time trust him in carrying out the strategies set before. Second, the school principal is an inspirational motivation, who is able to articulate clear expectations of the achievements of teachers and education staff, demonstrate his commitment to the overall goals of developing learning facilities and infrastructure, and arouse team spirit in school organizations through growing enthusiasm and optimism. With facilities and funds that are still minimal, the school principal is optimistic to develop learning facilities and infrastructure through empowering the resources of the school and establishing partnerships through cooperation with various parties involved and by developing businesses through the production unit.

The third dimension is the school principal as intellectual stimulation, who is able to foster new ideas, provide creative solutions to the problems faced, and provide motivations to vocational teachers to look for new approaches in carrying out tasks for developing learning facilities and infrastructure. Fourth, the school principal is an individualized consideration, who is listening carefully to constructive suggestions from other school elements related to the use of practical facilities and specifically paying attention to the needs and career development of teachers to give excellent performance.

The development of the manufacturing industry requires vocational schools to always prepare their graduates ready to adapt and be competitive in the development of science and technology. This requires them to always develop a curriculum that is in line with the demands of the world of business and industry, which will ultimately demand the development of learning facilities and infrastructure (Akdon, 2009; Sagala, 2011).

In order to meet future market demands, vocational schools must be able to develop learning facilities and infrastructure by completing practical facilities in accordance with the existing technology in the world of business and industry, both conventional and technology-assisted equipment. In addition, in managing learning facilities and infrastructure, vocational schools should not only rely on government funding or educational contributions from parents, but also look for other funding sources.

Sophisticated technology and easy access to information in the 21st century require teachers and school principals to creatively manage learning tools. Learning must be directed to facilitate students to be ready to face the world of work by having critical-thinking skills, creativity, communication, collaboration and ICT mastery skills (Care et al., 2018; Griffin et al., 2012; Griffin & Care, 2015; Shidiq & Yamtinah, 2019; Trilling & Fadel, 2009; Urbani et al., 2017). There have been many innovations made by teachers and students in vocational schools to improve the quality of learning.

Some efforts that have been made are utilizing students' android mobile phones as teaching materials for vocational students in Surabaya (Hakim et al., 2019), using *e-learning* as learning a method in several subject matters (Pevac et al., 2005; Sebnem, 2015; Tuna et al., 2018), link local wisdom into vocational learning (Anggraini & Kusniarti, 2017), using project-based methods by utilizing various facilities owned by students and schools (Chiang & Lee, 2016; See et al., 2015), and using the blended-learning method to maximize the potential of school ICT facilities (Irawan et al., 2017; Sugiarti et al., 2018). The creativity and innovation of learning undertaken by these teachers and researchers can also be used as a reference for teachers and school principals to utilize the potential of the existing facilities so that the learning becomes more interesting and meaningful.

CONCLUSION

In general, the school principal's strategy in optimizing the use of vocational practical facilities to improve the quality of graduates is already good, which can be seen from the students who are declared competent with the issuance of competency certificates from the world of business and industry. The application of the procurement, maintenance, and improvement processes of vocational practical facilities and their relevance to curriculum needs has not been implemented optimally. This can be seen from the type and amount of practice equipment that is still inadequate according to curriculum requirements.

Optimizing the use of practical facilities is implemented by dividing small groups and combining several competency standards in one teaching-learning activity. Some obstacles faced by school principals in developing learning facilities and infrastructure are that the maintenance of the vocational practical facilities is still not optimal due to the lack of funds that can be realized and the number of productive teachers in their relevant expertise competence is still inadequate. The school principal's efforts to overcome obstacles in the application of the procurement process, the use, maintenance and improvement of practical facilities in workshop management in order to improve graduate quality are carried out in various ways, starting from utilizing existing resources to request for assistance, either through the community, government or through the world of business and industry.

REFERENCES

- Akdon, A. (2009). *Strategic management for educational management*. Alfabeta.
- Anggraini, P., & Kusniarti, T. (2017). Character and local wisdom-based instructional model of Bahasa Indonesia in vocational high schools. *Journal of Education and Practice*, 8(5), 23–29. <https://www.iiste.org/Journals/index.php/JEP/article/view/35461>
- Bafadal, I. (2004). *Manajemen perlengkapan sekolah: Teori dan aplikasinya*. PT Bumi Aksara.
- Care, E., Griffin, P., & Wilson, M. (Eds.). (2018). *Assessment and teaching of 21st century skills*. Springer International Publishing. <https://doi.org/10.1007/978-3-319-65368-6>
- Chiang, C. L., & Lee, H. (2016). The effect of project-based learning on learning motivation and problem-solving ability of vocational high school students. *International Journal of Information and Education Technology*, 6(9), 709–712. <https://doi.org/10.7763/IJiet.2016.V6.779>
- Departmet of Education and Culture. (1981). *Pengelolaan sarana dan prasarana pendidikan*. Balai Pustaka.
- Djojonegoro, W. (1998). *Pengembangan sumber daya manusia melalui sekolah menengah kejuruan (SMK)*. Jayakarta Agung Offset.
- Evans, R. N. (1978). *Foundations of vocational education* (2nd ed.). A Bell&Howell Company.
- Griffin, P., & Care, E. (Eds.). (2015). *Assessment and teaching of 21st century skills*. Springer Netherlands. <https://doi.org/10.1007/978-94-017-9395-7>
- Griffin, P., McGaw, B., & Care, E. (Eds.). (2012). *Assessment and teaching of 21st century skills*. Springer Netherlands. <https://doi.org/10.1007/978-94-007-2324-5>
- Hakim, S. R., Kustijono, R., & Wiwin, E. (2019). The use of android-based teaching materials in physics learning process at vocational high school. *Journal of Physics: Conference Series*, 1171, 012024. <https://doi.org/10.1088/1742-6596/1171/1/012024>
- Hamalik, O. (1990). *Pendidikan tenaga kerja nasional, kejuruan, kewiraswastaan dan manajemen*. Citra Aditya Bakti.
- Hasibuan, M. S. P. (2006). *Manajemen, dasar, pengertian, dan masalah*. Bumi Aksara.
- Idrus, Y., & Arviana, R. (2018). Positioning technology in teaching fashion design. *Proceedings of the Sixth International Conference on Languages and Arts (ICLA 2017)*. <https://doi.org/10.2991/icla-17.2018.61>
- Ilyas, E. (2004). *Pemahaman SMM ISO 9001:2000 (SNI 19-9001-2001)*. TEDC.
- Indiana, K. (2005). *Optimalisasi pemanfaatan sarana dan prasarana dalam KBM untuk meningkatkan mutu pembelajaran bahasa dan sastra indonesia di SMPN 2 Paseh Kabupaten Bandung*. Master thesis. Universitas Islam Nusantara, Bandung.

- Irawan, V. T., Sutadji, E., & Widiyanti, W. (2017). Blended learning based on schoology: Effort of improvement learning outcome and practicum chance in vocational high school. *Cogent Education*, 4(1), 1282031. <https://doi.org/10.1080/2331186X.2017.1282031>
- Kruse, S. D. (2017). Educational leadership preparation in changing times. *Journal of Research on Leadership Education*, 12(2), 121–121. <https://doi.org/10.1177/1942775117718110>
- Kwan, P. (2020). Is transformational leadership theory Passé? Revisiting the integrative effect of instructional leadership and transformational leadership on student outcomes. *Educational Administration Quarterly*, 56(2), 321–349. <https://doi.org/10.1177/0013161X19861137>
- Law of Republic of Indonesia No. 20 of 2003 on National Education System, (2003).
- Mulyasana, D. (2011). *Pendidikan bermutu dan berdaya saing*. PT Remaja Rosdakarya.
- Nurjaman, D. S. (2011). *Hubungan iklim sekolah dan manajemen sarana prasarana dengan peningkatan mutu pendidikan*. Master thesis. Universitas Islam Nusantara, Bandung.
- Permadi, D., & Arifin, D. (2007). *Kepemimpinan transformasional kepala sekolah dan komite sekolah*. PT Sarana Panca Karya Nusa.
- Pevac, D. V., Milanovic, K. S., & Milosavljevic, M. M. (2005). E-learning method implementation in the high school vocational education. *EUROCON 2005 - The International Conference on "Computer as a Tool,"* 835–838. <https://doi.org/10.1109/EURCON.2005.1630062>
- Sagala, S. (2011). *Manajemen strategik dalam peningkatan mutu pendidikan*. Alfabeta.
- Sebnem, K. I. (2015). Investigation of students attitudes towards e-learning in terms of different variables: A case study in a technical and vocational high school for girls. *Educational Research and Reviews*, 10(1), 81–91. <https://doi.org/10.5897/ERR2014.1980>
- See, Y. G., Rashid, A. M., & Bakar, A. R. (2015). The effect of project based learning on level of content knowledge of pre-vocational subject. *Mediterranean Journal of Social Sciences*, 6(6 S4), 369–375. <https://doi.org/10.5901/mjss.2015.v6n6s4p369>
- Shidiq, A. S., & Yamtinah, S. (2019). Pre-service chemistry teachers' attitudes and attributes toward the twenty-first century skills. *Journal of Physics: Conference Series*, 1157, 042014. <https://doi.org/10.1088/1742-6596/1157/4/042014>
- Stein, K. C., Macaluso, M., & Stanulis, R. N. (2016). The interplay between principal leadership and teacher leader efficacy. *Journal of School Leadership*, 26(6), 1002–1032. <https://doi.org/10.1177/105268461602600605>
- Sudha, K. S., Shahnawaz, M. G., & Farhat, A. (2016). Leadership styles, leader's effectiveness and well-being: Exploring collective efficacy as a mediator. *Vision: The Journal of Business Perspective*, 20(2), 111–120. <https://doi.org/10.1177/0972262916637260>
- Sugiarti, Y., Nurmayani, S., & Mujdalipah, S. (2018). Analysis of blended learning implementation on Waste Treatment subjects in agricultural vocational school. *IOP Conference Series: Materials Science and Engineering*, 306, 012136. <https://doi.org/10.1088/1757-899X/306/1/012136>
- Taryana, E. (2011). *Manajemen sarana prasarana untuk meningkatkan mutu pembelajaran pada Madrasah Tsanawiyah di Kota Cimahi*. Master thesis. Universitas Islam Nusantara, Bandung.
- Taufik, A. W. (2011). *Manajemen sarana dan prasarana pembelajaran guna meningkatkan mutu pembelajaran IPA*. Master thesis. Universitas Islam Nusantara, Bandung.
- Terry, G. R., & Rue, L. W. (2005). *Dasar-dasar manajemen* (G. A. Ticoalu (Trans.)). PT Bumi Aksara.
- Trilling, B., & Fadel, C. (2009). *21st century skills: Learning for life in our times*. Jossey Bass.

- Tuna, J. R., Manoppo, C. T. M., Kaparang, D. R., & Mewengkang, A. (2018). E-learning development process for operating system course in vocational school. *IOP Conference Series: Materials Science and Engineering*, 306, 012068. <https://doi.org/10.1088/1757-899X/306/1/012068>
- Umar, H. (2003). *Strategic management in action*. PT Gramedia Pustaka Utama.
- Urbani, J. J. M., Truesdell, E., Urbani, J. J. M., Roshandel, S., Michaels, R., Truesdell, E., Anderman, E. M., Sinatra, G. M., Gray, D. L. L., Demirel, M., Fadel, C., Burkhardt, G., Monsour, M., Valdez, G., Gunn, C., Dawson, M., Lemke, C., Martin, C., Povee, K., ... Truesdell, E. (2017). Assessment and teaching of 21st century skills. *Educacion Quimica*, 1(1), 1709–1716. <https://doi.org/10.1016/j.sbspro.2009.01.303>
- Wotto, W. (2000). *Manajemen peralatan dan bahan praktek*. Gajah Mada University Press.
- Young, M. (2004). The importance of vocational pedagogy. . *Paper Presented at the Research Seminar: Vocational Pedagogy*.
- Zamroni, Z. (2007). *Pendidikan dan demokrasi dalam transisi (prakondisi menuju era globalisasi)*. PSAP Muhammadiyah.