

## A Need Analysis Survey on the Development of On-The-Job Training Web Application in Vocational College

Selvi Rajamanickam, Ridzwan Che' Rus & Mohd Nazri Abdul  
Raji

Faculty of Technical and Vocational, Universiti Pendidikan Sultan Idris, Tanjong Malim Perak  
Malaysia

Corresponding Author's Email: [tberinselvi77@gmail.com](mailto:tberinselvi77@gmail.com)

To Link this Article: <http://dx.doi.org/10.6007/IJARBSS/v13-i15/18805> DOI:10.6007/IJARBSS/v13-i15/18805

*Published Date: 07-10-2023*

### Abstract

On Job Training (OJT) is best for skill development and attitude change. Implementation of OJT focuses on the transition of students to working life. Vocational college under the branch of TVET, needs to be based on recognized job standards, with an emphasis on practical components, psychomotor skills and exposure to training in the industry. Industrial management in vocational colleges should be systematic and efficient in line with the technology era. Therefore, a needs analysis survey was conducted to identify the needs of the OJT web application in vocational colleges and to identify several key elements that needs to be prioritized in the development of the OJT web application. This needs analysis survey was conducted on 70 vocational colleges OJT supervisors, 2 Technical and Vocational Education Division (BPLTV) officers under the vocational curriculum development unit of the TVET curriculum sector, 30 OJT students and 10 construction industry companies. The results of the study found that vocational college OJT management requires an OJT web application for more effective and systematic management. The results of this study found that some important elements should be emphasized during the development of the OJT web application. It includes elements such as curriculum, time management, screen display and industry database.

**Keywords:** On-The-Job Training, Web Application, Vocational College, OJT Management

### Introduction

Referring to the 2021 OJT Guidelines issued by the Vocational Technical Training Education Division (BPLTV), industrial training for vocational college students is known as OJT. OJT is mandatory for Malaysian Vocational Diploma Program (DVM) students in all vocational

colleges. However, the management of OJT at the Vocational College should be more systematic and efficient in line with the digital revolution of today's technology. This research is focused on the need analysis survey on the development of an OJT web application and its applicability to vocational college OJT management. The OJT web application can be used in OJT management to improve management efficiency. The use of computers and technological tools in education makes one educational institution more advanced and growing rapidly in line with current progress. In addition, today's rapid development of information and communication technology (ICT) has also breathed new life into the development of education. According to Nicodemus Kalugho Mwambela & Simon Nyaga Mwendia (2019), digitization in education management refers to the ability to use digital technology to generate, process, share, and transaction information. Mohd Faizal Md Karim (2018) also stated that, many public and private education sectors in Malaysia have applied web-based information system management. Therefore, web applications are developed for faster loading, interactive and mobile (Lawal Olarotimi Badru, Vani Vasudevan & Govinda Ishwar Lingam, 2022). Web technology is a revolution to the use of the internet and the web that has the characteristics of information sharing, easy to operate, and user-friendly design on the World Wide Web (Zuki & Khalid, 2016). This is supported by He Zhao (2022), in which the integration system through web applications in education information management not only facilitates the sharing of information but also improves the management quality of an education department. Web applications also facilitate the storage of large amounts of student data and minimize the use of paper (Pangestu & Samsinar, 2018). According to Adam et al (2022), the starting point for the success of industrial training depends on three main elements, which are robustness of planning, implementation and evaluation. Based on the study of effective system functionality in public education institutions in Malaysia, UTM, UKM, and UPSI have already used a web application system widely in the field of industrial training management (Tan & Arshad, 2016) whereas vocational college in Malaysia still doesn't have an online management system for OJT management.

### **Literature Review**

Vocational education and training (VET) are commonly known as skill-based education that provides hands-on, job-specific training and occupational experience. According to Ali Rizwan et al (2021), ensuring the sustainability of these programs is highly dependent on the inclusion of vocational education and training (VET) as a crucial element. With the rise of Industry 4.0, mobile applications have become an essential part of our daily lives. It is imperative for all parties to adapt to the changes to remain competitive (Ali & Ibrahim, 2018). Abdul Rahman et al (2020) suggest that the education industry can utilize the widespread popularity of the internet to introduce digital learning. Additionally, the authors argue that implementing digital learning through the internet not only helps to achieve national objectives but also enhances the country's competitiveness in the knowledge-based global era. According to Nur Aiman bin Zainudin' (2021), wireless technology in education can help bridge the digital divide among developing countries. This study also highlights how the Ministry of Education Malaysia (KPM) is promoting the Digital Education Learning Initiative Malaysia (DELIMa) through the distribution of Google ID MOE-DL. DELIMa empowers digital education among students and the management of digital education at the college level. This is supported by the increased positive perception of school management documentation practices through the utilization of an application system.

However, referring to the results of the Ministry of Higher Education's survey in the TVET Empowerment Book in Malaysia A Review (2019 Edition), it was found that there is no standard system to measure the capabilities of an institution clearly and consistently. Hence, it becomes challenging for the government to allocate funds based on Outcome-Based Budgeting. This refers to the efforts to improve performance management in the public sector and to assess the efficiency and effectiveness of a TVET institution. Thus, graduates need to be prepared with knowledge and skills from a relevant and appropriate technical point of view to overcome challenges in the industry through high resilience and good judgment. In order to prepare for world innovation, appropriate education needs to be taken by the new generation (Fadel & Ishar, 2022). Therefore, the use of computer technology that combines various media such as text, graphics, animation, video and audio controlled by computers is necessary in the world of educational management (Ismail et al., 2022). In line with the statement, the development of the OJT web application not only improves the management efficiency of the vocational college OJT management but also benefits its users consisting of students, lecturers and industry. This is supported by Rita Irviani and Pontianus Setiawan (2017) who stated that web applications speed up the communication process that initially happened traditionally (conventional) to become more modern (based on web technology). Indirectly, communication happens more effectively, quickly, and efficiently. Web technology is also needed as a web-based information service medium (Chumairoh et al., 2014). Several studies have also been conducted to identify the effectiveness of existing OJT applications or systems in government institutions. The results of the study are shown in Table 1. Studies shows, the OJT web application facilitates the OJT management process and it helps to coordinate between college, students, and industry.

Table 1

*Effectiveness of existing OJT web application/system*

Author	Research title	Effectiveness of Web application /system
Jamil et al (2018)	Indus-Train1 System Medium for monitoring and evaluation of students during industrial training	Feedback from the respondents shows that the Indus-Train system helps to overcome problems related to the evaluation and monitoring of students and thus can achieve the targeted objectives
Handaya et al (2019)	Netbeans and Android- based Electronic Industrial Training Application	Improve effectiveness in management of industrial training
Tawyer et al (2021)	The use of the iDirectory mobile application among Pasir Gudang Community College students	The results show a high level of effectiveness among users in terms of the physical aspects of the i-Directory system.
Rashid & Humaidi (2021)	The Development of the Students Industrial Training Information System (FBM-STIS)	This system not only benefits training coordinators and administrative staff but also students in which they do not have to go to faculty for the training application process.

Utama et al (2022)	Analysis Planning and Monitoring OJT Smk Negeri 1 Boyolali	This system can assist site supervisors and college supervisors in carrying out all activities of management, monitoring, reporting and evaluation of On-The-Job Training (OJT) activities as well as assisting students in managing attendance data and reporting of OJT activities.
--------------------	--	---

## Methodology

The use of mixed-methods enables researchers to answer research questions with sufficient depth and breadth (Enosh et al., 2014). For example, the quantitative approach helps a researcher to collect data from a large number of participants; thus, increasing the possibility to generalise the findings to a wider population. Dawadi et al (2021) stated that- the qualitative approach, on the other hand, provides a deeper understanding of the issue being investigated, honouring the voices of its participants. In other words, quantitative data bring breadth to the study and qualitative data provides depth to it. Therefore, both qualitative and quantitative techniques have been used by the researcher to obtain data. In the context of this study, three constructs are studied for OJT web application development needs. The construct is the view of students, OJT supervisors from college, and industry towards the current OJT management. Interviews were conducted with 2 BPLTV officers under the vocational curriculum development unit of the TVET curriculum sector and 5 OJT supervisors who were randomly selected from vocational colleges. Quantitative research is done by using questionnaire instruments. Questionnaire instruments were given randomly to 70 OJT supervisors selected from the construction technology course, 30 OJT students from the construction technology course, and 10 construction industry companies.

## Results

Interviews with several representatives of polytechnic and ILP lecturers found that the institution has also used a web-based system in the management of student industrial training. Apart from that, the results of the need analysis survey show, public and private educational institutions such as USIM, USM, UPM, UNISZA, UNISEL, and UTHM also have a web application system for the management of industrial training students. Based on the above statement, it can be concluded that the use of web applications is a necessity in creating a systematic industrial training management system in the field of education. Yusof and Mohiddin (2018), stated that industrial relations and training units should have an efficient and systematic administrative management system. The results of surveys and interviews with students, lecturers, and the industry found that Vocational Colleges do not have a systematic system or application to manage the OJT course. Apart from that, the results of the survey also found that students who do not get an industrial training place need to contact the OJT management directly for application matters. Based on a survey conducted on 10 construction industry companies, it was also found that student's personal information, OJT guidelines and college supervisor information are quite difficult to reach and refer to. Continuous triangulation between curriculum, educational opportunities and employer needs should be aligned to ensure students' ability to explore pathways from college to the workplace. The vocational college is responsible for determining that graduates get the necessary industry exposure as preparation before stepping into the world of work by ensuring that they manifest the knowledge learned while at the college. Lecturers,

students and the industry are directly involved in OJT management. As a result of the interview conducted with the OJT coordinator of the vocational college, it was found that the vocational college does not have a system or access to a systematic OJT management web application. The OJT coordinator has also informed us that the filling in of marks is still carried out manually on Excel Pre-Adop and Adop templates. On the other hand, the work load is added when the vocational college OJT management has to send a report to the director of the Vocational College and the Technical and Vocational Training Education Division. This has to be done manually. Therefore, the development of an application is needed to give access to the college, industry, and students. Interviews with 2 BPLTV officials from the curriculum development unit found that BPLTV still does not have a systematic online application system for OJT management. Apart from that, attendance and daily reports of students are also difficult to obtain through manual methods. Student monitoring is also very difficult. They also stated that by developing the OJT web application, OJT students management will be more systematic. BPLTV officials also stated that this OJT web application can also be used as a reference in curriculum development with the existence of an industry database. Table 2,3 and 4 below shows the findings of need analysis from OJT supervisors, students and construction industries engaged with Vocational College.

Table 2

*Needs Analysis Findings from Vocational College OJT Supervisors*

Item	Percentage (%)	
	Agree	Disagree
1. Students get On-The-Job Training offers easily	40%	60%
2. On-The-Job Training offer application takes a short time	29%	71.5%
3. Most On-The-Job Training offer applications are made more than 2 times	63%	37.10%
4. The process of applying for an industrial training place is quite easy and fast.	41%	58.60%
5. Students are given a list of industrial companies that meet the requirements before applying for industrial training.	44%	55.70%
6. The industry was briefed on the use of the On-The-Job Training forms.	37%	62.80%
7. On-The-Job Training evaluation involves more than 20 forms	60%	40%
8. Each On-The-Job Training form has different codes	97%	2.9%
9. A maximum of 15 OJT forms are used during the On-The- Job Training process.	80%	20%
10. On-The-Job Training evaluation score calculation used a manual method	89%	11.5%

A needs analysis survey was conducted on 70 Malaysian Vocational College OJT supervisors through questionnaires. 80% of lecturers stated that 15 OJT forms are used maximally in OJT management. Apart from that, 89% of the lecturers stated that the OJT evaluation marks were still calculated using the manual method while 60% of the lecturers stated that it was not easy to get an OJT offer. 62.8% of the lecturers stated that briefing on the use of the form was not given to the industry before the OJT training begin. 71.5% of lecturers stated that the application process for industrial training takes time. This clearly shows that the OJT management of the Vocational College needs a web application that can facilitate the implementation of the OJT course at the Vocational College

Table 3

*Need Analysis Findings from OJT students from the year 2017-2020*

Item	Percentage (%)	
	Agree	Disagree
1. Students get On-The-Job Training offers easily	37%	63.3%
2. The OJT handbook is always brought to the training site	93%	6.7%
3. Dealing with the OJT offer application takes a long time	87%	13.3%
4. Students are given a list of industrial companies that meet the requirements before applying for industrial offers	40%	60%
5. The extensive use of OJT forms is quite confusing	77%	23.3%
6. Industrial supervisors need a clearer explanation of the training required	93%	6.7%
7. I refer to the OJT handbook more often every day	73%	26.6%
8. I always refer to the current rules of OJT in the OJT handbook	80%	20%
9. I always refer to the OJT handbook to know the preparation before OJT	83%	16.6%
10. Most OJT applications are done more than 2 times	87%	13.4%

Referring to Table 3 above, a needs analysis survey was conducted on 30 random vocational college students from the year 2017 to 2020 intake. A total of 63.3% of students stated that it was quite difficult to obtain industry offers and 86.7% of students stated that the process of applying for job offers took a long time. 60% of students stated that they did not receive the list of industrial training places as a reference. A total of 76.7% of students stated that the OJT form was a bit confusing. Besides, 93.4% of students stated that the OJT handbook is always taken to the industry as a reference. According to Fazeera Syuhada Abdullah et al (2019), the manual method not only complicates the students, but also makes it difficult for the lecturers who manage industrial training. This is supported by Satrio (2019), who states that students have to spend time preparing important documents that need to be sent to an organization even though their application has not necessarily been accepted or rejected.

Table 4

*Need Analysis Findings from 10 Construction Industry Companies*

Item	Percentage (%)	
	Agree	Disagree
1. Students apply for industrial placement easily with industrial companies	33%	80%
2. Students' personal information can be easily accessed	27%	73%
3. OJT guidelines can be easily accessed	27%	73%
4. The information of the college supervisors involved can be easily reached	27%	73%
5. The OJT evaluation form is evaluated to be filled in manually	73%	27%
6. All OJT Forms used before and after OJT are also filled in manually	87%	13%
7. The industry needs a platform to share information about the job market with the vocational college OJT management	87%	13%
8. Training information required by industrial training students is provided by the college in advance	27%	73%
9. OJT management using manual methods makes the OJT management process difficult and less systematic	87%	13%

10. OJT student information and evaluation is easier if it can be managed using a mobile application	87%	13%
--	-----	-----

Table 4 shows the needs analysis findings from 10 Construction Industry Companies. Based on a survey conducted on 10 construction industry companies, it was found that student profile information, OJT guidelines, and college supervisor information are quite difficult to reach and refer to. 87% of companies stated that the industry needs a platform to share information about the job market with the vocational college OJT management. The industry also suggests the use of mobile web applications to improve the effectiveness of industrial training management. This clearly shows that the OJT web application is necessary to create systematic and effective digitalization management. Apart from that, there is a gap between employers' performance expectations and students' performance in the context of work efficiency (Siddoo et. al., 2018). This is supported by Piah and Haron (2018), who state that the existence of vocational colleges is one of the approaches taken by the education system in Malaysia to reduce the gap of mismatch among students with the workforce needs in the industrial sector. Therefore, by developing the OJT web application, OJT management can fill that gap by creating a database of construction industry companies that can be reached by students, industry and college lecturers. Triangulation between curriculum, educational opportunities and employer needs will help to ensure students' ability to explore pathways from college to the workplace. Therefore, the development of web applications as one of the industry's information channels can also strengthen the regulation by giving a positive impact.

### **Elements that needs to be prioritized in the development of the OJT web application**

#### ***OJT Assessment Rubric***

OJT is being introduced to empower competency and improve students' workability. Therefore, OJT assessment is vital to ensure the effectiveness of OJT in Malaysian vocational colleges. Lecturers and industry professionals should work together to produce a reliable and valid assessment rubric to measure student's performance to ensure student quality is at par with the industry requirement (Abdul Musid et al., 2020). A good assessment rubric should have sufficient criteria for assessing students' performance in the OJT. It will help in producing competent graduates that possess high potential in becoming skilled workers in the future. However, only a little attention has been given to the criteria of the OJT assessment rubric. Therefore, curriculum development should be in line with industry needs. Database of industrial companies and job market information should be emphasized during web application development (Celarta & Esponilla, 2021). Developing an OJT rubric that is aligned with the needs of the industrial market is essential in ensuring that students are adequately prepared for the workplace. Collaboration between educational institutions, industry partners, and the curriculum development department can help ensure that the OJT rubric is comprehensive and covers all the necessary competencies and skills required in the industry. Educational institutions, on the other hand, can provide insights into the academic and practical requirements of students. They can also ensure that the rubric is aligned with the curriculum and the learning outcomes of the program. The curriculum development department can provide guidance and support in the development of the OJT rubric. They can also ensure that the rubric is in line with the national or regional standards and benchmarks for vocational education. In conclusion, a collaboration between all stakeholders is crucial in the development of an effective OJT rubric that meets the needs of the industry and adequately prepares students for the workforce.

**Elements in the web application screen display**

The Industrial and Alumni Relations Unit (UPIA) delivers information related to industrial training to students who will undergo industrial training as well as to students currently undergoing industrial training. Among the information that OJT management should share is, the industrial training syllabus, industrial training calendar, industry list and the latest information and documents that can be downloaded by students (Tawyer et al., 2021). In order to achieve the objective of producing graduates with high marketability, potential employers can also advertise job offers through web networking. Referring to Table 5 below, there is a gap in the current industrial training system (Tan & Arshad, 2016). Thus, the OJT web application development could, indirectly create a triangulation network between students, lecturers, and the industry.

Table 5

*Comparison of system function* (Adaptation from Nurul Asyikin Zamri Tan dan Marina Md. Arshad 2016)

em function	JTM	ILAI UKM	MYSISUPSI
List of organizations that can apply			
Electronic application form			
Check application status			
Description of application status			
Notification via SMS			
Notification via email/ Facebook			
Application procedure checklist			

**Jobmarket Database**

The effectiveness of vocational education and training (VET) depends on the quality of interactions between the actors from the education and employment systems, which ensure the correspondence of skills supply and demand. According to Bolli et al (2018), surveying VET experts from 18 countries suggests that countries with dual VET have the highest education employment linkage, while the included Asian countries score lowest in terms of education employment linkage. The analysis further reveals that the three most important sub-processes are employer involvement in the definition of qualification standards; employer involvement in deciding the timing of curriculum updates; and the combination of workplace training with classroom education. Rapid research progress in science and technology (S&T) and continuously shifting workforce needs to exert pressure on each other and on the educational and training systems that link them. Higher education institutions aim to equip new generations of students with skills and expertise relevant to workforce participation for decades to come, but their offerings sometimes misalign with commercial needs and new techniques forged at the frontiers of research (Katy Börnera, Olga Scrivera & Mike Gallanta, 2018). Therefore, the industrial database should be included as a key element during the development of the OJT web application.

**Recommendation & Conclusion**

The mismatch between the industry's demand for the skills possessed by TVET graduates is also caused by the lack of the industry's involvement in curriculum development and expertise sharing with TVET institutions (KPT, 2020). The development of the OJT web application will strengthen the more organized and efficient management of OJT. The use of digital technology can change the atmosphere of teaching and learning to be more modern



and interesting compared to traditional methods. The results of the study found that the strategy of using web applications in education in the era of Industrial Revolution 4.0 is based on four main elements namely creativity, reflectivity, reciprocity, and responsibility. In addition, the technological progress of a country will be a benchmark for the level of progress that has been achieved. It shows the ability to apply technology towards the universal good. It is recommended to develop the OJT web application as a curriculum evaluation reference. Besides, education institutions can get feedback from the industry and professional bodies, improve relationships with the existing industry. Finally, it will help to achieve a meaningful two-way relationship to find a meeting point between the supply and demand of human capital. Overall, it can be concluded that, the development of OJT the application provides a better management system. OJT web application can be managed easily and is less complex between the college coordinator and the industry. This system can manage all the documents needed for every student and training coordinator. Indirectly, it will reduce OJT management workload. Besides, it will simplify communication between the company and Industrial Training Coordinator. This web-based system will provide a clear guideline to students, companies and college supervisors. There has been much concern about the quality of Malaysian graduates. Employers in the country generally feel there is a gap in graduate skills, suggesting that universities do not necessarily provide enough opportunities for students to develop the abilities critical to the labour market. The Education Minister of Malaysia reported that nearly 60 percent of degree holders and above remain unemployed after one year of graduating. With today's rapidly changing pace of the job market, employees need to keep abreast of new knowledge and technology. It is heartening to note that many companies value industrial placement as a way to train future employees and consider offering such training programs as their corporate social responsibility. Therefore, the development of a web application with an industrial database helps students obtain hands-on experience and know the real job scenario besides strengthening the relationship between industry, students and OJT management.

### **Acknowledgements**

This research was supported by BPLTV officials named Mohd Hanifah Bin Mohd Haniff, Ts. Rosman Bin Bahri dan Aminamul bt Saidah (Curriculum Development Sector), Vocational College lecturers and China State Construction Engineering Health, Safety and Environment Director Parthiban Ponusamy.

### **References**

- Abdul Musid, N., Mohd Affandi, H., Sohimi, N. E., & Mustaffa Kamal, M. F. (2020). On the Job Training (OJT) Assessment for Diploma in Construction Technology. *Built Environment Journal*, 17(2), 29. <https://doi.org/10.24191/bej.v17i2.8872>
- Ahadi, S., & Jacobs, R. L. (2017). A Review of the Literature on Structured On-the-Job Training and Directions for Future Research. *Human Resource Development Review*, 16(4), 323–349. <https://doi.org/10.1177/1534484317725945>
- Arief Ramdhany, M., Supriyatna, Y., & Arief Ramdhany, M. (2016). *A Model of Effective School Management at Vocational High Schools*. <https://www.researchgate.net/publication/316862833>
- Azmi, A. N., Kamin, Y., Noordin, M. K., & Ahmad, A. N. (2018). Towards industrial revolution 4.0: Employers' expectations on fresh engineering graduates. *International Journal of Engineering and Technology(UAE)*, 7(4), 267–272.

- <https://doi.org/10.14419/ijet.v7i4.28.22593>
- Bolli, T., Caves, K. M., Renold, U., & Buerger, J. (2018). Beyond employer engagement: measuring education-employment linkage in vocational education and training programmes. *Journal of Vocational Education and Training*, 68(20), 1–40. <https://doi.org/10.1080/13636820.2018.1451911>
- Borner, K., Scrivner, O., Gallant, M., Ma, S., Liu, X., Chewing, K., Wu, L., & Evans, J. A. (2018). Skill discrepancies between research, education, and jobs reveal the critical need to supply soft skills for the data economy. *Proceedings of the National Academy of Sciences of the United States of America*, 115(50), 12630–12637. <https://doi.org/10.1073/pnas.1804247115>
- Celarta, C. B., & Esponilla, F. D. (2021). Industrial education competencies: Valuing students stakeholder's role in the academe. *Cypriot Journal of Educational Sciences*, 16(1), 46–56. <https://doi.org/10.18844/cjes.v16i1.5507>
- Cheney, D. L. (2011). Cooperation in nonhuman primates: Function and cognition. *Animal Thinking: Contemporary Issues in Comparative Cognition*, 239–252. <https://doi.org/10.7551/mitpress/9187.003.0022>
- Chumairoh, M. S. (2015). Perancang Bangun Aplikasi Mobile Pada Platform Android Berbasis Html5 Studi Kasus Layanan Informasi Website Unipdu Jombang. *Edutic - Scientific Journal of Informatics Education*, 1(1), 1–6. <https://doi.org/10.21107/edutic.v1i1.402>
- Dawadi, S., Shrestha, S., & Giri, R. A. (2021). Mixed-Methods Research: A Discussion on its Types, Challenges, and Criticisms. *Journal of Practical Studies in Education*, 2(2), 25–36
- Enosh, G., Tzafir, S. S., & Stolovy, T. (2014). The development of client violence questionnaire (CVQ). *Journal of Mixed Methods Research*, 9(3), 273–290. <https://doi.org/10.1177/1558689814525263>
- Frolund, L. (n.d.). *Developing Successful Strategic Partnerships With Universities Cite this paper*. <http://mitsmr.com/2Av1gVE>
- Ibrahim, A., & Nashir, I. M. (2022). Trends and patterns of needs assessments in technical and vocational education: A thematic review. *International Journal of Evaluation and Research in Education*, 11(1), 88–98. <https://doi.org/10.11591/ijere.v11i1.21940>
- Irviani, R., & Setiawan, P. (2017). Aplikasi Berbagi Pesan Berbasis Web Sebagai Media Komunikasi Di Stmik Pringsewu. *Semnasteknomedia Online*, 5(1), 4–7–13. <https://ojs.amikom.ac.id/index.php/semnasteknomedia/article/view/1819/1541>
- Kleinert, C., Vosseler, A., & Blien, U. (2018). Classifying vocational training markets. *Annals of Regional Science*, 61(1), 31–48. <https://doi.org/10.1007/s00168-017-0856-z>
- Komarov, V. A., & Sarafanov, A. V. (2021). IoT systems in the process of multidisciplinary training of personnel for the digital economy and their design. *Business Informatics*, 15(2), 47–59. <https://doi.org/10.17323/2587-814X.2021.2.47.59>
- Korber, M., & Oesch, D. (2019). Vocational versus general education: Employment and earnings over the life course in Switzerland. *Advances in Life Course Research*, 40(March), 1–13. <https://doi.org/10.1016/j.alcr.2019.03.003>
- Mardis, M. A., Ma, J., Jones, F. R., Ambavarapu, C. R., Kelleher, H. M., Spears, L. I., & McClure, C. R. (2018). Assessing alignment between information technology educational opportunities, professional requirements, and industry demands. *Education and Information Technologies*, 23(4), 1547–1584. <https://doi.org/10.1007/s10639-017-9678-y>

- Meyer, M. W., & Norman, D. (2020). Changing Design Education for the 21st Century. *She Ji*, 6(1), 13–49. <https://doi.org/10.1016/j.sheji.2019.12.002>
- Yusof, M. H., Arsat, M., Amin, N. F., & Abdul Latif, A. (2020). Issue and Challenge for Vocational Teaching Quality in the Vocational College Lecturers: A Systematic Review/ Isu dan Cabaran Kualiti Penyampaian Pengajaran Bidang Vokasional dalam Kalangan Pensyarah Kolej Vokasional: Satu Ulasan Sistematis. *Sains Humanika*, 12(2–2), 9–13. <https://doi.org/10.11113/sh.v12n2-2.1779>
- Muizz, N., Salleh, M., Wan, C., Cw, S. B., Khirulnizam, A., & Rahman, A. (2018). *Kajian Mengenai Keberkesanan Subjek Latihan Industri Di Kalangan Pelajar Semester Akhir Fakulti Sains & Teknologi Maklumat, KUIS*. 1–8.
- Na, K. (2021). *The Effect of On-the-Job Training and Education Level of Employees on Innovation in Emerging Markets*. <https://doi.org/10.3390/joitmc>
- Rizwan, A., Serbaya, S. H., Saleem, M., Alsulami, H., Karras, D. A., & Alamgir, Z. (2021). A preliminary analysis of the perception gap between employers and vocational students for career sustainability. *Sustainability (Switzerland)*, 13(20). <https://doi.org/10.3390/su132011327>
- Roseley, N. R. N., Kasolang, S., Amedorme, S. K., Saad, N. H., Venkatasen, K., & Makhsin, S. R. (2021). The Effectiveness of Industrial Training during Covid-19 Pandemic: Perspective of Undergraduate Students of Mechanical Engineering. *Asian Journal of University Education*, 17(4), 11–23. <https://doi.org/10.24191/ajue.v17i4.16223>
- Saifudin, M., Piah, M., & Haron, Z. (2018). *Latihan Industri Kolej Vokasional: Keberkesanan Pelaksanaanya Dari Perspektif Pelatih*.
- Siddoo, V., Sawattawee, J., Janchai, W., & Yodmongkol, P. (2017). Exploring the competency gap of it students in Thailand: The employers' view of an effective workforce. *Journal of Technical Education and Training*, 9(2), 1–15.
- Suharno, Pambudi, N. A., & Harjanto, B. (2020). Vocational education in Indonesia: History, development, opportunities, and challenges. *Children and Youth Services Review*, 115(May), 105092. <https://doi.org/10.1016/j.childyouth.2020.105092>
- Sultanah, P., Bahiyah, T., Hassan, M., Fathimah, N., & Zambi, M. (2021). *Employer ' s Perspective Towards Industrial Training Students of Commerce*. 2, 19–25.
- Tan, W. K., & Umemoto, M. (2021). International industrial internship: A case study from a japanese engineering university perspective. *Education Sciences*, 11(4). <https://doi.org/10.3390/educsci11040156>
- Kompen, T. R., Edirisingha, P., Canaleta, X., Alsina, M., & Monguet, J. M. (2019). Personal learning Environments based on Web 2.0 services in higher education. *Telematics and Informatics*, 38(August 2018), 194–206. <https://doi.org/10.1016/j.tele.2018.10.003>
- Tri Pangestu, S. (n.d.). *Penggunaan model waterfall dalam aplikasi sistem informasi jasa konsultan pendidikan australia berbasis web pada pt velocity*.
- Vasanthi, S., & Rabiyyathul, S. (2019). On the Job Training Implementation and Its Benefits. *International Journal of Research and Analytical Reviews (IJRAR)*, 6(1), 210–215.
- Yasin, R. M., Nur, A. Y. F., Ridzwan, C. R., Ashikin, H. T., & Bekri, R. M. (2013). Current trends in technical and vocational education research: A meta-analysis. *Asian Social Science*, 9(13), 243–251. <https://doi.org/10.5539/ass.v9n13p243>
- Zhu, Y., Geng, X., & Zhang, Q. (2019). Research on Curriculum Reform of Industrial Training Center Based on PDCA Cycle. *International Journal of Information and Education Technology*, 9(8), 570–574. <https://doi.org/10.18178/ijiet.2019.9.8.1268s>