ONLINE LEARNING CLASS SETTING: RECURRENT HUMAN FACTOR TRAINING FOR AIRCRAFT MAINTENANCE ENGINEER LICENSE HOLDER

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Abstract: This study discusses the class setting for online recurrent human factor training for AMEL holders. The online class setting for recurrent human factor training was developed to meet the needs for implementing training without requiring AMEL holders to return to class, while still meeting the training objectives. The study explores specific examples of learning methods, including a mix of lectures, discussions, and group work. It also considers the use of blended learning classes, particularly in the flipped classroom format, and the option of including a problem-based learning approach. Further research is needed to develop a recurrent human factors training class setting and examine its effectiveness.

Keywords: flipped classroom, human factor; online learning, problem-based learning

Introduction

Loo (2019) explains that further education is a learning setting with a broad reach covering various fields and educational institutions, both formal and informal. Loo also explained that the learning arrangements in further education include participants aged 16 years and over to adulthood and lifelong learners with various learning abilities.

In Indonesia, regulations govern further education in aircraft maintenance. Individuals seeking to perform aircraft maintenance in the country must first obtain a basic certificate in the field. This certificate requires a combination of formal and informal education and training to achieve the necessary competencies. The specific requirements for obtaining this basic certificate are outlined in Lampiran Keputusan Direktur Jenderal Perhubungan Udara, Advisory Circular (AC) 147-02 Basic Certificate Curriculum and Syllabus Development, Amendment: 0 (2017).

In the field of aviation, aircraft maintenance has been recognized as a significant area of focus (Insley & Turkoglu, 2020) due to its direct influence on aviation safety (Khan et al., 2020). According to Khan et al. (2020), aircraft maintenance encompasses activities such as repair, inspection, overhaul, troubleshooting, and modification of aircraft components. Thorough familiarity with a particular aircraft type is essential for individuals involved in aircraft maintenance.

Aircraft maintenance personnel who only have a basic certificate have limited privilege to carry out maintenance and must be under the supervision of aircraft maintenance personnel who already have an aircraft maintenance engineer license (AMEL). To obtain AMEL, an aircraft maintenance personnel must have a basic certificate, attend education and training for certain

types of aircraft, and other requirements as stipulated in (Sathe et al., 2023) in line with the Indonesian authority regulation in Lampiran Keputusan Menteri Perhubungan, Civil Aviation Safety Regulation (CASR) Part 65 Licensing of Aircraft Maintenance Engineer, Edition: 1, Amendment: 0 (2017). Furthermore, the regulation stipulates that the validity period of AMEL is three years, and its validity must be extended with certain conditions, one of which is the obligation to include the graduation of recurrent human factor training.

The requirement for recurrent human factor training as a prerequisite for the renewal of AMEL is crucial. According to ICAO (2003), most aviation accidents are attributed to human errors during routine activities. A comprehensive understanding of human factors is essential to minimize accidents in aviation. Furthermore, the FAA (2018) highlights the significance of aircraft maintenance personnel developing the ability to prevent errors and injuries through their interactions with organizations, work groups, and human variables. Research indicates the critical role of human factors in effectively carrying out aircraft maintenance tasks (Karunakaran et al., 2021).

By the previously mentioned guidelines, all AMEL holders in aircraft maintenance must undergo recurrent human factor training at least once every three years. For airlines with busy operations and a limited number of aircraft maintenance personnel, scheduling their staff for this training can be challenging. To address this, a viable solution is to provide recurrent human factor training in a setting that does not disrupt their work activities, such as through online learning. This study proposes the online recurrent human factor training setting for AMEL holders. Thambirajah et al. (2022) revealed that learners can improved on their technical terms acquisition in online platforms and the online learning approach enabled collaboration between the lecturer and the learner

Theoretical and Literature Review
Online Learning Environment
The online learning classes for recurrent human factor training were designed to fulfill the need for recurrent human factor training without requiring aircraft maintenance personnel with AMEL holders to physically attend classes. This approach ensures that the learning objectives of recurrent human factor training are still achieved. When implemented effectively, human factors training offers the opportunity to revisit fundamental principles, stay updated on evolving practices, policies, and challenges, and reaffirm employees' commitment to the company's safety objectives. Ultimately, human factors training equips workers to maintain a high level of awareness about their actions and their impact on workplace safety (Johnson, 2014).

Online learning faces various challenges, as studies by (Muflih et al., 2021) have highlighted. These include issues such as unstable internet connection, lack of motivation, and insufficient instruction. On the positive side, online discussions are effective in enhancing existing knowledge, providing practical guidance, and assessing attitudes (Leong & Nguyen, 2011). Hoi et al. (2021) categorized online learning into three types: supervised online learning with complete feedback, learning with limited feedback, and unsupervised online learning without any available feedback. Additionally, according to Sit et al. (2005), human interaction, especially interaction with fellow students, is crucial, and peer support can be challenging for students in online learning environments.

Robb & Shellenbarger (2021) highlighted the importance of online learning institutions being sensitive to addressing challenges in their strategies by (1) Understanding the needs of the training participants. (2) Building a supportive community. (3) Establishing a strong online presence to foster engagement and restore disrupted participant connections.

In a study conducted in 2015, Hung & Chou identified five crucial dimensions of an instructor's role and behavior in online learning: training designers and organizers; discussion facilitators; providing social support; facilitating technology use; and designing assessments. Research by Selvi (2010) found that motivation in online learning is affected by the teaching-learning process, teacher competence, participant attention, online learning environment/technical infrastructure, and time management. Beffa-Negrini et al. (2002) recommended that effective learning planning in online education should prioritize the level of challenge in assessments, active problem-solving, multidimensional learning, and relevance and personalization.

Recurrent Human Factor Training

When designing an online learning program for recurrent human factor training for AMEL holders of aircraft maintenance personnel, it's crucial to address the specific aspects of recurrent human factor training and online learning, while also taking into account the characteristics and needs of the training participants.

According to Ron LoFaro, PhD in FAA (2018), the human factor is related to performance optimization, including reducing errors so that the highest level of security is achieved and maintained. In another reference, it is stated that the human factor is the study of how humans interact with their environment (FAA, 2016).

Johnson (1997) explains the following about the class setting in human factor training for aircraft maintenance personnel: (1) Using content-specific examples is the best instructional method. These examples should be tailored to the individual groups of training participants. (2) The culture of the training participants encourages a balanced mix of lectures, class discussions, and group activities. (3) Some cultural learners expect 2-3 days of lectures, while others express dissatisfaction with instructional methods. (4) A "one size fits all" approach doesn't work for human factors training. (5) Communication must start from the beginning of the training. (6) Course notes, handouts, books, and other multimedia materials should be provided to all students.

ICAO (2003) is the world's leading aviation organization and has developed a guide for creating a comprehensive human factor training syllabus for aircraft maintenance personnel. This guide covers various topics such as an introduction to Human Factors, Safety culture and organizational factors, Human error, Human Performance, Environment, Procedures, Information, Tools, and Practices, Communications, Teamwork, Professionalism, and Integrity, and The maintenance of the organization's own Human Factors program.

Setting Class of Online Learning for Recurrent Human Factors Training

The online learning class setting for recurrent human factor training was designed based on the theoretical framework mentioned above, which includes recurrent human factor training and the online learning environment. **Figure 1** illustrates the class setting for online recurrent human factor training. The class settings were developed with a focus on classroom settings, drawing on Johnson's experience.

The recurrent human factor training depicted in **Figure 1** follows a class setting inspired by Johnson (1997) approach, integrating specific examples of the learning method while promoting a blend of lectures, discussions, and group work. This approach aligns with the principles of problem-based learning.

Problem-based learning is an effective approach for students to develop a wide range of skills, including observation, critical thinking, problem-solving, and operational skills (Li et al., 2020). According to Zhou (2017), in problem-based learning, students engage in collaborative, student-centered learning to address complex real-world problems that often lack a single correct answer. The role of the teacher is to facilitate the learning process rather than simply imparting

knowledge, making "student-centered learning" the fundamental principle of problem-based learning. Building on this, Duch et al. (2001) emphasize that this approach motivates students by presenting them with challenging, complex, real-world problems, encouraging them to identify and research the necessary concepts and principles for solving these problems. This often involves small-team learning and the collaborative development of skills in information acquisition, communication, and integration.

Addressing the challenges and issues in the online learning environment mentioned above can be achieved by incorporating face-to-face online learning. Face-to-face online sessions are particularly beneficial at the onset of the training and after problem-solving reflection, resulting in a blended learning approach. According to Boelens et al. (2017), face-to-face interactions typically promote social engagement, while online learning activities are generally personalized and involve monitoring student progress. Sit et al. (2005) emphasized the significance of human interaction, particularly interaction among participants, as peer support can be challenging to establish in online learning environments.

More specifically, the instructional approach depicted in Figure 1 represents a flipped classroom model, which is one of the blended learning models (Horn & Staker, 2015). According to Ng (2015), there is a need to shift the learning culture in the flipped classroom from the traditional method of in-person classes followed by homework to a new approach of completing homework before in-person sessions. Ng (2015) also cited evidence supporting the successful implementation of the flipped classroom in both schools and higher education.
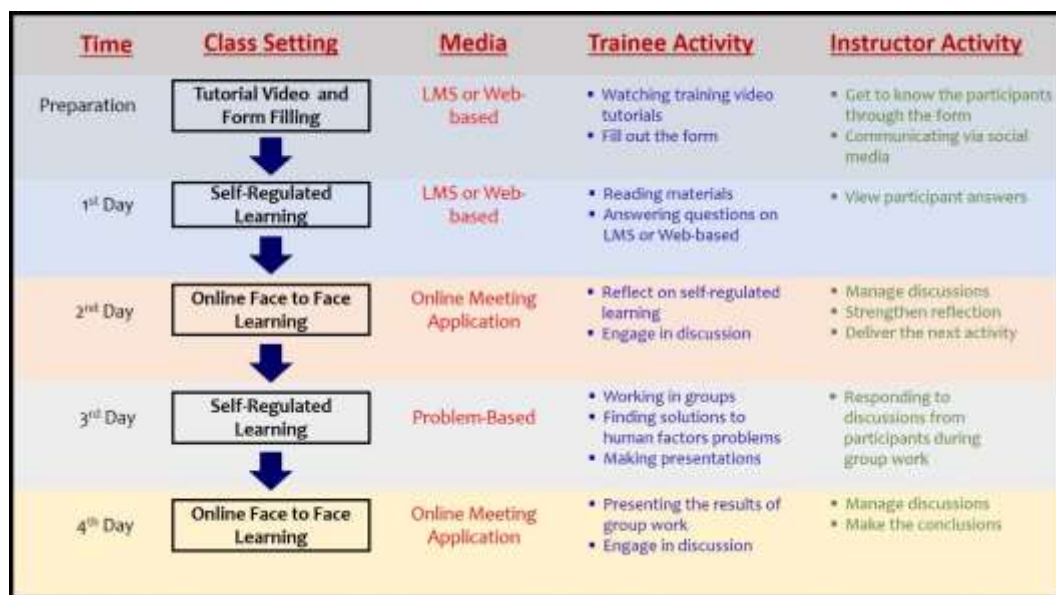
Time	Class Setting	Media	Trainee Activity	Instructor Activity
Preparation	Tutorial Video and Form Filling	LMS or Web-based	• Watching training video tutorials • Fill out the form	• Get to know the participants through the form • Communicating via social media
1st Day	Self-Regulated Learning	LMS or Web-based	• Reading materials • Answering questions on LMS or Web-based	• View participant answers
2nd Day	Online Face to Face Learning	Online Meeting Application	• Reflect on self-regulated learning • Engage in discussion	• Manage discussions • Strengthen reflection • Deliver the next activity
3rd Day	Self-Regulated Learning	Problem-Based	• Working in groups • Finding solutions to human factors problems • Making presentations	• Responding to discussions from participants during group work
4th Day	Online Face to Face Learning	Online Meeting Application	• Presenting the results of group work • Engage in discussion	• Manage discussions • Make the conclusions

Figure 1 Setting class of online learning for recurrent human factors training

Discussion

The flipped-classroom learning could significantly improve problem-solving ability also (Lin, 2018). Using a modified flipped-classroom model with resources on the LMS and an online homework system to help students strengthen their knowledge and skills and solve higher-level problems in mixed-skilled peer groups (Mahalingam & Fasella, 2017). The experiment (Guan et al., 2015) have revealed the flipped classroom can improve the problem-solving ability and other ability. A flipped classroom with team-based learning enhanced the students' knowledge, problem-solving ability, and learning satisfaction (Kang & Kim, 2021). One of the main ICT skill

is Problem Solving Skill, flipped classroom helps to enhance students' ICT Problem Solving Skill (Wen et al., 2016). Together with problem solving skills, critical thinking is included in analytic skills, the research results (Munir et al., 2018) showed that flipped classroom helped to develop and improve students learning and critical analysis skills and have positive effect on students critical thinking ability (Dehghanzadeh & Jafaraghaee, 2018) (Andrini et al., 2019). The relationship between the flipped classroom and the development of critical thinking became the title of the research (DeRuisseau, 2016) that a key finding of this study is that a flipped classroom approach allowed for more time devoted to active learning and a transition of assessment questions to include additional high- er-order thinking activities. The students had a statistically significant and growth in information literacy competency and critical thinking skills and the students and teachers positively perceived about the digital classrooms in flipped classroom format on supporting the development them (Kong, 2014)

According to experimental results have demonstrated by Guan et al. (2015) that flipped classroom teaching mode played a role in not only developing students' good learning habits, improving their learning initiative, solving the problem, practical ability, communication and cooperation ability, but also creativity. Students undergoing flipped learning, had better performance in creativity (Tien et al., 2020) and may promote students' creativity, especially with regard to fluency; flexibility; and novelty and the students viewed the flipped classroom as an approach that may significantly facilitate their creativity (Al-Zahrani, 2015). Result research of Rodríguez et al. (2019) showed that students had the perception of having developed creative and critical thinking skills and social awareness throughout the flipped classroom methodology. Students were able to nurture their creativity and adaptability to working with others leads to a more overall positive outlook toward learning in a flipped classroom (Gomez-lanier, 2018).

In 3rd the participant working in group to solve the human factors problem. Collaboration is the most important skill in working life skills which is the improvement can be supported by the flipped classroom environment (Väisänen & Hirsto, 2020). Problem-based learning in format flipped classroom provides students the opportunity to increase self-directed learning and collaboration (Yurniwati & Utomo, 2020). Students enjoy flipped classroom learning by practicing "good" study habits, such as submitting assignments early re-taking quizzes for extra practice and being motivated to improve their study habits, such as being team-based and gamification. Flipped classroom also enhances student social experience (Sprint & Fox, 2020) and significantly increased collaborative peer dialogue among the learners (Zarrinabadi & Ebrahimi, 2019). During collaborative problem solving in flipped classroom student comparing individual work, interacting with peers, and interacting with the instructor (Karabulut-Ilgu et al., 2018).

Information processing is necessary in this class setting. Likewise, information literacy is important in working life skills its development can be supported by the flipped classroom (Väisänen & Hirsto, 2020). The flipped classroom and jigsaw model helped the student to get the information and answered the problem of students living in a rapidly evolving technology era (Rombot et al., 2018). Information literacy growth together with critical thinking ability by digital classroom in flipped classroom format (Kong, 2014). In Information literacy instruction the flipped classroom can be to engage critical thinking and problem-solving skills that can be learned best through experience (Arnold-Garza, 2014). Although there is no difference was found between the two groups on a pre-and post-test analysis the majority of students preferred the flipped approach in information literacy session instruction (Brooks, 2014).

All studies show that the advantages of the flipped classroom can not only support the development of one ability but more than one ability, this shows great benefits in the flipped classroom. To get the greatest benefit from the flipped classroom, it can be combined with other

learning strategies or tools to produce a new model, in this study several learning strategies were combined with the flipped classroom.

Conclusion

      The online format for recurrent human factor training was specifically developed to offer training for aircraft maintenance personnel without the participants being physically present. This method ensures that the recurrent human factor training goals are accomplished. It implements blended learning, especially in a flipped classroom setup, which utilizes a problem-based learning approach to fulfill the training objectives. Further study is required to develop class formats for recurrent human factor training and to examine effectiveness.

Bibliography

Abdullah, B., & Bin Azizan, M. T. (2017). A Flipped Classroom Technique in Improving Students' Grade of Transport Phenomena Course. *Proceedings - 2017 7th World Engineering Education Forum (WEEF)*, *November*, 279–284. https://doi.org/10.1109/WEEF.2017.8467163

Al-Zahrani, A. M. (2015). From passive to active: The impact of the flipped classroom through social learning platforms on higher education students' creative thinking. *British Journal of Educational Technology*, *46*(6), 1133–1148. https://doi.org/10.1111/bjet.12353

AlJaser, A. M. (2017). Effectiveness of Using Flipped Classroom Strategy in Academic Achievement and Self-Efficacy among Education Students of Princess Nourah bint Abdulrahman University. *English Language Teaching*, *10*(4), 67–77. https://doi.org/10.5539/elt.v10n4p67

Andrini, V. S., Pratama, H., & Maduretno, T. W. (2019). The effect of flipped classroom and project based learning model on student's critical thinking ability. *Journal of Physics: Conference Series*, *1171*, 012010. https://doi.org/10.1088/1742-6596/1171/1/012010

Arnold-Garza, S. (2014). The flipped classroom teaching model and its use for information literacy instruction. *Communications in Information Literacy*, *8*(1), 7–22. https://doi.org/10.15760/comminfolit.2014.8.1.161

Autor, D. H., Levy, F., & Murnane, R. J. (2003). The skill content of recent technological change: an empirical exploration. *Quarterly Journal of Economics*, *118*(4), 1279–1333.

Baytiyeh, H. (2017). The flipped classroom model: when technology enhances professional skills. *The International Journal of Information and Learning Technology*, *34*(1), 51–62. https://doi.org/10.1108/IJILT-07-2016-0025

Beffa-Negrini, P. A., Cohen, N. L., & Miller, B. (2002). Strategies to Motivate Students in Online Learning Environments. *Journal of Nutrition Education and Behavior*, *34*(6), 334–340. https://doi.org/10.1016/S1499-4046(06)60116-4

Boelens, R., De Wever, B., & Voet, M. (2017). Four key challenges to the design of blended learning: A systematic literature review. *Educational Research Review*, *22*, 1–18. https://doi.org/10.1016/j.edurev.2017.06.001

Boyles, T. (2012). 21st century knowledge, skills, and abilities and entrepreneurial competencies: a model for undergraduate entrepreneurship education. *Journal of Entrepreneurship Education*, *15*, 41–55.

Brooks, A. W. (2014). Information literacy and the flipped classroom: Examining the impact of a one-shot flipped class on student learning and perceptions. *Communications in Information Literacy*, *8*(2), 225–235. https://doi.org/10.15760/comminfolit.2014.8.2.168

Chou, L.-Y. (2018). The Effect of Flipped Classroom on Self-efficacy and Satisfaction of Computer Auditing. In L. Barolli & T. Enokido (Eds.), *Innovative Mobile and Internet Services in Ubiquitous Computing. IMIS 2017. Advances in Intelligent Systems and Computing* (Vol. 612, pp. 841–845). Springer, Cham. https://doi.org/10.1007/s10758-017-9343-y

Dehghanzadeh, S., & Jafaraghaee, F. (2018). Comparing the effects of traditional lecture and flipped classroom on nursing students' critical thinking disposition: A quasi-experimental study. *Nurse Education Today*, *71*, 151–156. https://doi.org/10.1016/j.nedt.2018.09.027

DeRuisseau, L. R. (2016). The flipped classroom allows for more class time devoted to critical thinking. *Advances in Physiology Education*, *40*(4), 522–528. https://doi.org/10.1152/ADVAN.00033.2016

Duch, B. J., Groh, S. E., & Allen, D. E. (2001). Why Problem-Based Learning? A Case Study of Institutional Change in Undergraduate Education. In B. J. Duch, S. E. Groh, & D. E. Allen (Eds.), *The power of problem-based learning: a practical "how to" for teaching undergraduate courses in any discipline* (1st ed., pp. 3–11). Stylus Publishing, LLC.

FAA-H-8083-25B. (2016). *Pilot's Handbook of Aeronautical Knowledge*. U.S. Department of Transportation, Federal Aviation Administration. https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/phak/media/pilot_handbook.pdf

FAA-H-8083-30A. (2018). *Aviation Maintenance Technician Handbook—General*. U.S. Department of Transportation, Federal Aviation Administration. https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/media/amt_general_handbook.pdf

Finegold, D., & Notabartolo, A. S. (2010). 21st century competencies and their impact: An interdisciplinary literature review. *Transforming the US Workforce Development System*, 19–56.

Gomez-lanier, L. (2018). Building Collaboration in the Flipped Classroom: A Case Study. *International Journal for the Scholarship of Teaching and Learning*, *12*(2), 1–9. https://doi.org/10.20429/ijsotl.2018.120207

González-Gómez, D., Jeong, J. S., & Cañada-Cañada, F. (2019). Enhancing science self-efficacy and attitudes of Pre-Service Teachers (PST) through a flipped classroom learning environment. *Interactive Learning Environments*, 1–12. https://doi.org/10.1080/10494820.2019.1696843

Guan, L., Yuan, N., Xie, Y., Feng, J., Sun, B., & Li, L. (2015). A study on the application of flipped classroom teaching in higher vocational education. *10th International Conference on Computer Science and Education, ICCSE 2015*, 819–823. https://doi.org/10.1109/ICCSE.2015.7250358

Hoi, S. C. H., Sahoo, D., Lu, J., & Zhao, P. (2021). Online learning: A comprehensive survey. *Neurocomputing*, *459*, 249–289. https://doi.org/10.1016/j.neucom.2021.04.112

Horn, M. B., & Staker, H. (2015). *Blended Using Disruptive Innovation to Improve Schools* (1st ed.). Jossey-Bass, A Wiley Brand.

Human Factors Guidelines for Aircraft Maintenance Manual, Pub. L. No. Doc 9824 AN/450 (2003).

Insley, J., & Turkoglu, C. (2020). A contemporary analysis of aircraft maintenance-related accidents and serious incidents. *Aerospace*, *7*(6), 1–27. https://doi.org/10.3390/AEROSPACE7060081

Johnson, W. B. (2014). Human Factors Training – Evolution and Reinforcement. In *The Operator's Manual for Human Factors in Maintenance and Ground Operations* (2nd ed., pp. 24–28). Federal Aviation Administration. https://www.faa.gov/about/initiatives/maintenance_hf/library/documents/media/human_factors_maintenance/hf_ops_manual_2014.pdf

Johnson, W. B. (1997). Human factors training for aviation maintenance personnel. *Proceedings of the Human Factors and Ergonomics Society*, *2*, 1168–1171. https://doi.org/10.1177/107118139704100299

Kang, H. Y., & Kim, H. R. (2021). Impact of blended learning on learning outcomes in the public healthcare education course: a review of flipped classroom with team-based learning. *BMC Medical Education*, *21*(78), 1–8. https://doi.org/10.1186/s12909-021-02508-y

Karabulut-Ilgu, A., Yao, S., Savolainen, P., & Jahren, C. (2018). Student Perspectives on the Flipped-Classroom Approach and Collaborative Problem-Solving Process. *Journal of Educational Computing Research*, *56*(4), 513–537. https://doi.org/10.1177/0735633117715033

Karunakaran, C. S., Ashok Babu, J., Khaja Sheriff, J., Vishnupriya, B., & Mukesh Kumar, S. (2021). Overview on the effect of aircraft maintenance human factor training in Indian MRO

profitability and safety. *Materials Today: Proceedings*, *xxxx*, 1–6. https://doi.org/10.1016/j.matpr.2020.12.798

Khan, F. N., Ayiei, A., Murray, J., Baxter, G., & Wild, G. (2020). A preliminary investigation of maintenance contributions to commercial air transport accidents. *Aerospace*, *7*(9), 1–21. https://doi.org/10.3390/aerospace7090129

Kong, S. C. (2014). Developing information literacy and critical thinking skills through domain knowledge learning in digital classrooms: An experience of practicing flipped classroom strategy. *Computers and Education*, *78*, 160–173. https://doi.org/10.1016/j.compedu.2014.05.009

Lampiran Keputusan Direktur Jenderal Perhubungan Udara, Advisory Circular (AC) 147-02 Basic Certificate Curriculum and Syllabus Development, Amendment: 0, Pub. L. No. KP 269 Tahun 2017 (2017).

Lampiran Peraturan Menteri Perhubungan, Civil Aviation Safety Regulation (CASR) Part 65 Licensing of Aircraft Maintenance Engineer, Edition: 1, Amendment: 0, Pub. L. No. Permenhub No.75 Tahun 2017 (2017).

Leong, J., & Nguyen, L. H. (2011). Continuing professional development for RMIT International University Vietnam library staff: Adding value through an international partnership: A case study. *International Information and Library Review*, *43*(3), 169–175. https://doi.org/10.1016/j.iilr.2011.07.008

Li, X., Xie, F., Li, X., Li, G., Chen, X., Lv, J., & Peng, C. (2020). Development, application, and evaluation of a problem-based learning method in clinical laboratory education. *Clinica Chimica Acta*, *510*, 681–684. https://doi.org/10.1016/j.cca.2020.08.037

Lin, Y. T. (2018). Impacts of a flipped classroom with a smart learning diagnosis system on students' learning performance, perception, and problem solving ability in a software engineering course. *Computers in Human Behavior*, *95*, 187–196. https://doi.org/10.1016/j.chb.2018.11.036

Loo, S. (2018). *Further Education, Professional and Occupational Pedagogy* (1st ed.). Routledge. https://doi.org/https://doi.org/10.4324/9781351050678

Mahalingam, M., & Fasella, E. (2017). 11 - Effective use of technology for asynchronous learning to elevate students' knowledge and problem-solving ability. In S. P. Ferris & H. Wilder (Eds.), *Unplugging the Classroom* (pp. 149–158). Chandos Publishing. https://doi.org/10.1016/B978-0-08-102035-7.00011-4

Muflih, S., Abuhammd, Sawsan Al-Azzam, S., Alzoubi, K. H., Muflih, M., & Karasneh, R. (2021). Online learning for undergraduate health professional education during COVID-19: Jordanian medical students' attitudes and perceptions. *Heliyon*, *7*(9), e08031. https://doi.org/10.1016/j.heliyon.2021.e08031

Munir, M. T., Baroutian, S., Young, B. R., & Carter, S. (2018). Flipped classroom with cooperative learning as a cornerstone. *Education for Chemical Engineers*, *23*, 25–33. https://doi.org/10.1016/j.ece.2018.05.001

Namaziandost, E., Ahmad Tilwani, S., Mahdizadeh Khodayari, S., Ziafar, M., Alekasir, S., Gilakjani, A. P., & Mohammed Sawalmeh, M. H. (2020). Flipped classroom model and self-efficacy in an iranian english as a foreign language context: A gender-based study. *Journal of University Teaching and Learning Practice*, *17*(5), 1–14.

Ng, W. (2015). Technology Integration and Flipped Classroom. In *New Digital Technology in Education Conceptualizing Professional Learning for Educators* (pp. 149–169). Springer International Publishing. https://doi.org/10.1007/978-3-319-05822-1

Ohtake, P. J., Lyons, A., Glogowski, M., Stellrecht, E., Aronoff, N., Grabowski, J., & Zafron, M. L. (2018). Using an interprofessional flipped classroom educational strategy for developing evidence-based practice knowledge and skills. *Journal of Interprofessional Education and Practice*, *11*, 7–11. https://doi.org/10.1016/j.xjep.2017.12.010

Oriarewo, G. O., Ofobruku, S. A., Agbaezee, K., & Tor, Z. A. (2018). The Influence of Emotional Stability on Employees' Performance: A Review. *South Asian Journal of Social Studies and Economics*, *2*(1), 1–8. https://doi.org/10.9734/sajsse/2018/v2i125820

Robb, M., & Shellenbarger, T. (2021). The distracted online student: Strategies to capture attention and promote connection. *Teaching and Learning in Nursing*, *16*(4), 389–392.

https://doi.org/10.1016/j.teln.2021.05.008

Rodríguez, G., Díez, J., Pérez, N., Baños, J. E., & Carrió, M. (2019). Flipped classroom: Fostering creative skills in undergraduate students of health sciences. *Thinking Skills and Creativity*, *33*, 100575. https://doi.org/10.1016/j.tsc.2019.100575

Rombot, O., Doringin, F., & Ariesta, F. W. (2018). The Collaboration of Flipped Classroom and Jigsaw Model to Improve the Student's Character in Elementary School in Jakarta. *Proceedings - 2018 International Symposium on Educational Technology, ISET 2018*, *3*, 63–67. https://doi.org/10.1109/ISET.2018.00023

Sathe, N. C., Carney, P. A., & Furnari, M. (2023). Nourish: A pilot program to support self-Efficacy, learning, and wellness during USMLE step 1 preparation. *Medical Education Online*, *28*(1). https://doi.org/10.1080/10872981.2022.2153781

Selvi, K. (2010). Motivating factors in online courses. *Procedia Social and Behavioral Sciences*, *2*(2), 819–824. https://doi.org/10.1016/j.sbspro.2010.03.110

Sit, J. W. H., Chung, J. W. Y., Chow, M. C. M., & Wong, T. K. S. (2005). Experiences of online learning: Students' perspective. *Nurse Education Today*, *25*(2), 140–147. https://doi.org/10.1016/j.nedt.2004.11.004

Sprint, G., & Fox, E. (2020). Improving student study choices in cs1 with gamification and flipped classrooms. *Annual Conference on Innovation and Technology in Computer Science Education, ITiCSE*, 773–779. https://doi.org/10.1145/3328778.3366888

Tazijan, F. N., Baharom, S. S., & Shaari, A. H. (2016). Building Communication Skills Through Flipped Classroom. *Proceedings of the Fourth International Seminar On English Language and Teaching (ISELT-4)*, 289–295. https://doi.org/10.34105/j.kmel.2019.11.016

Thambirajah, J. I., Krish, P., & Shaari, A. H. (2022). The Acquisition of Technical Terms using the Online Learning Approach among Aircraft Maintenance Learners. *3L: The Southeast Asian Journal of English Language Studies*, *28*(2), 211–223. https://doi.org/10.17576/3L-2022-2802-14

Thongkoo, K., Panjaburee, P., & Daungcharone, K. (2019). Integrating inquiry learning and knowledge management into a flipped classroom to improve students' web programming performance in higher education. *Knowledge Management and E-Learning*, *11*(3), 304–324. https://doi.org/10.34105/j.kmel.2019.11.016

Tien, L. C., Lin, S. Y., Yin, H., & Chang, J. C. (2020). The Impact of a Flipped Classroom on the Creativity of Students in a Cake Decorating Art Club. *Frontiers in Psychology*, *11*, 1–13. https://doi.org/10.3389/fpsyg.2020.533187

Väisänen, S., & Hirsto, L. (2020). How can flipped classroom approach support the development of university students' working life skills?—university teachers' viewpoint. *Education Sciences*, *10*(12), 1–15. https://doi.org/10.3390/educsci10120366

Wen, A. S., Zaid, N. M., & Harun, J. (2016). Enhancing students ICT problem solving skills using flipped classroom model. *2016 IEEE 8th International Conference on Engineering Education (ICEED)*, 187–192. https://doi.org/10.1109/ICEED.2016.7856069

Yurniwati, Y., & Utomo, E. (2020). Problem-based learning flipped classroom design for developing higher-order thinking skills during the COVID-19 pandemic in geometry domain. *Journal of Physics: Conference Series*, *1663*(1), 012057. https://doi.org/10.1088/1742-6596/1663/1/012057

Zarrinabadi, N., & Ebrahimi, A. (2019). Increasing peer collaborative dialogue using a flipped classroom strategy. *Innovation in Language Learning and Teaching*, *13*(3), 267–276. https://doi.org/10.1080/17501229.2018.1455688

Zheng, X., Johnson, T. E., & Zhou, C. (2020). A pilot study examining the impact of collaborative mind mapping strategy in a flipped classroom: learning achievement, self-efficacy, motivation, and students' acceptance. *Educational Technology Research and Development*, *68*, 3527–3545. https://doi.org/10.1007/s11423-020-09868-0

Zhou, C. (2017). Fostering Creative Problem Solvers in Higher Education: A Response to Complexity of Societies. In *Handbook of Research on Creative Problem-Solving Skill Development in Higher Education* (pp. 1–23). IGI Global. https://doi.org/10.4018/978-1-5225-0643-0.ch001