How to Cite:
Rahmawati, I., Komariah, A., Permana, J., & Kurniatun, T. C. (2021). Development of online forums with the colles model in improving student knowledge management. *Linguistics and Culture Review*, *5*(S4), 2523-2534.
https://doi.org/10.21744/lingcure.v5nS4.2045

Development of Online Forums with the COLLES Model in Improving Student Knowledge Management

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***Abstract*---**The purpose of this research is the development of online forum-based learning media to improve Knowledge Management in Bogor Polbagtan students with more flexibility in terms of cost, time and place. This research uses the Research and Development (R & D) method by developing learning media in the form of online forums to improve knowledge management consisting of tacit knowledge and explicit knowledge. In developing instructional media in the form of online forums, the steps refer to the research design and development of the Borg and Gall models. The subjects of this study were students of Bogor Polbagtan, meanwhile, to measure the impact of this study, using the COLLES method. Based on research findings in the field, the results of data analysis, and reflections on every trial conducted, Research and Development produces learning media, online forums for improving knowledge management among students. While the impact on the development of online forums using the COLLES method obtained a score of 4.07 which is at a good interval, which means students are comfortable and accept learning media in the form of online forums for learning tools to increase Knowledge Management.

***Keywords*---**COLLES method, development, knowledge management, online forums, student knowledge.

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Manuscript submitted: 18 August 2021, Manuscript revised: 09 Nov 2021, Accepted for publication: 27 Dec 2021

Introduction

In the world of education, gaining knowledge is one of the important objectives of learning activities in addition to forming attitudes, character and skills. Each learner has each knowledge to obtained both theoretically and in experience. The knowledge possessed by each learner can indicate the level of competency of the expertise possessed, with the increase in knowledge the competency of the learners also increases. Competency improvement can be done by continuing study to a higher level of education, attending training / workshops, seminars, book review or through study groups of a professional community (Diniati et al., 2018). The knowledge possessed is different from one another depending on the understanding received by each learner (Shomirzayev, 2021). The knowledge possessed by every learner such as at a university is a valuable asset and becomes an added value for an organization to be able to compete and be superior to other organizations. Therefore it is very important for universities to be able to manage knowledge (knowledge management) as well as possible.

Knowledge management for students is intended so that learning can take place effectively and efficiently in addition to growing intrinsic motivation to learn for each student (Liao, 2003; Zheng et al., 2010). The process of increasing the knowledge possessed by students should be well managed by universities through the process of knowledge management. Knowledge that will be managed in knowledge management is divided into 2 types of knowledge, namely tacit knowledge and explicit knowledge (Sari & Tania, 2014; Honeycutt, 2000; Marquardt, 2002). Tacit knowledge is knowledge that is contained in the brain/mind of a person in accordance with the understanding, expertise and experience of that person. Explicit knowledge is knowledge that has been collected and translated into a form of documentation so that it is more easily understood and disseminated by others (Saade et al., 2011). These two types of knowledge must be identified so that the process of knowledge management can take place optimally. One of the knowledge management processes in higher education is the transfer of knowledge from one student to another, from lecturers to students and from students to lecturers (Dave & Koskela, 2009; Liebowitz, 2001).

With the knowledge transfer activity, any knowledge possessed by each personnel, be it tacit or explicit knowledge, can also be owned by other personnel. If the personnel who have the knowledge are unable to carry out their duties or have even moved from the organization, the existing knowledge can still be used by other personnel in the organization because of the prior knowledge transfer process (Itkulova et al., 2021). The process of knowledge transfer makes the activities contained within the organization not only depend on one or a group of personnel. The process of knowledge transfer in the world of education is the main activity in lecturing activities in the classroom in the form of lecturers providing or transferring knowledge held by lecturers to students (Debowski, 2006). On a smaller scale, the process of knowledge transfer can also be in the form of transfer of knowledge between fellow students, from senior students to junior students or can also be of the opposite nature from junior students to senior students (Aryani & Rahayuni, 2016). The process of transfer of knowledge

between fellow students aims to improve student competency and knowledge (Nyandra et al., 2018).

In the current era of technological development, the process of knowledge transfer is no longer conventional in the form of direct face to face but can take the form of the use of information technology systems based on online forums (Li & Wu, 2010; Prestridge, 2010). Online forums are a means of communication between users where in the forum there are sections or categories created in groups to make it easier for users to interact and search for the knowledge that users want (Rozanda et al., 2017; SmitDev Community, 2007; Juju & Sulianta, 2013). The use of online forums is intended as a forum for users to be able to exchange knowledge and improve their own competence and as a place of discussion so that communication can be created even though in a long distance and different places (Koh et al., 2010; Mariani et al., 2017; Metzler & Woessmann, 2012).

Based on preliminary research conducted on students conducted by researchers, it is known that there is no forum in the form of online forums in the form of websites owned by students (Shaw, 2012). At present there is a group messenger / chat using the Telegram application that is used to provide information - information from POLBANGTAN organizers or related to student organizations (Student Association) activities (Rusli et al., 2021). In the preliminary research, students also revealed that they needed an online forum, in the form of a website as a place to share knowledge that could increase student competency and knowledge (Altbach & Balán, 2007).

Literature review

Higher education (PT) is an institution that has a strategic role in creating reliable human resources, who are able to have high knowledge to always be transferred and developed for the benefit of society (Esthi & Sukmawati, 2011). Knowledge management (KM) plays an important role in higher education which aims to: 1) develop better quality and effectiveness 2) for the development of human resources at all levels, and 3) to develop the "knowledge base" of the organization towards increasing organizational knowledge investment (Nilsook & Sriwongkol, 2009; Songsangyos, 2012). Many universities have integrated KM in learning. This is so that tacit and explicit knowledge can be managed optimally and programmed systematically (Pattnaya, 2017; Thongkoo et al., 2019). Systematization of KM in learning in order to realize the benefits of knowledge to achieve the competitive advantage of a PT. KM enables knowledge to be organized in terms of its creation, acquisition, distribution, and influence as well as its benefits for the creation of a competitive advantage of a PT (Fauzi et al., 2018; Girard et al., 2016; Thongkoo et al., 2019). The integration of KM into learning has become a separate concept in PT management [18] done collaboratively interactively with students lecturers (Fauzi et al., 2018; Girard et al., 2016; Butnariu & Milos, 2012; Thongkoo et al., 2019). In addition, KM is also concerned with the management, development, and transfer of knowledge between students interacting within a university (Ma, 2007).

PT facilitation in KM integrated into learning is mediated by information technology. Technology makes it possible to capture knowledge; define, store,

classify, index, and connect digital objects that correspond to units of knowledge; find and subscribe to relevant content; and presents content with enough flexibility to make it meaningful and can be applied in a variety of user contexts.

Previously, Nonaka & Takeuchi (1995), had found the SECI model that connects explicit knowledge and tacit in the form of a never-ending spiral and the learning process occurs constantly. In this SECI model, KM was developed, ranging from Socialization, Externalization, combination, and Internalization. Referring to this model, PT develops a social interaction model where experienced individuals transfer their knowledge to other people or groups of people directly through online forums. The Seci model has successfully linked knowledge with e-learning (Thongkoo et al., 2019).

In the current technological development, the process of knowledge transfer is no longer conventional in the form of face-to-face but can take the form of the use of information technology systems based on online forums. Online forums are a means of communication between users where in the forum there are sections or categories created in groups to make it easier for users to interact and search for the knowledge that users want (SmitDev Community, 2007; Juju & Sulianta, 2013; Budiarti, 2015). The use of online forums is intended as a forum for users to be able to exchange knowledge and improve self-competence and as a place of discussion so that communication can be created even though in a long distance and different places.

COLLES or Constructivist On-Line Learning Environment Survey is a questionnaire specifically intended to determine the level of comfort in the use of online learning systems (e learning) by teachers (lecturers, teachers) and students (students, students) in supporting the process of knowledge transfer (Taylor & Maor, 2000). The COLLES method contains 6 factors: Relevance, Reflection, Interactive, Tutor-Support. COLLES or Constructivist On-line Learning Environment Survey developed by Peter Charles Taylor and Dorit Maor (Ratnasari, 2012), from Curtin University of Technology Australia in order to measure the extent to which web-based learning can enrich student knowledge. COLLES is suitable to be applied in developing the role of the internet in learning at PT (Borg & Gall, 2003).

Research Methods

This research uses the Research and Development (R & D) method. In developing instructional media in the form of online forums, the steps refer to the design of research and development of the Borg and Gall model which consists of steps of identifying potential and problems (Research and Information Collecting), Literature and Information Collection (Planning), Initial Product Design (Develop Preliminary Form a Product), Limited Trial (Preliminary Field Testing), Product Revision I (Main Product Revision), Main Field Testing (Main Field Testing), Product Revision II (Operational Product Revision) to Implementation (Dessemination and Implementation) (Sugiyono, 2015).

The targets of this research are students at Polbagtan Bogor, Indonesia. As for the students at POLBANGTAN Bogor consists of level II, level III and level IV students

with each level as many as 20 people so that there are a total of 60 people as respondents in this study. Whereas to measure the feasibility of the product, a measurement model was carried out using the Contructivist Online Learning Environment Survey (COLLES) method (Nainggolan, 2016).

Result and Discussion

There are ten steps in Research and Development research, but in this study there are six steps, namely up to the Main Field Testing step. Steps seven to ten are not carried out due to research limitations. The elaboration of the six steps can be explained as follows:

1. Research and Information Collecting
   Research and Development carried out in this study is based on the collection of initial potential data conducted through the open questionnaire method and addressed to representatives of students of Level II, III and IV. From these questionnaire questions, data were obtained about the potential of the research as follows:

   a) Containers or applications currently used by students in the means of sharing knowledge in the form of e-mail (zimbra webmail), telegram groups, cloud sharing.
   b) At this time there is no forum or online forum based application that is used by students as a means of sharing knowledge. Existing containers in the form of campus webmail, telegram groups and cloud sharing but are not based on online forums and exchanged with information related to student activities.
   c) Students agree and feel the need for an online forum as a forum and means for students to be able to share knowledge and experience with fellow students.
   d) Features that are needed by students in online forums include the task sharing feature; feature asking about an issue; file, video and photo sharing features; information features about published journals; information features on seminars and competitions for students; features of sharing papers, reading references, documentation of activities; features that involve lecturers for consultations on knowledge in the academic field.

2. Planning
   Literature studies and research information collection are carried out by describing the educational curriculum in POLBANGTAN to be able to identify what knowledge is available during the lecture process. Explicit knowledge can be categorized with lecture material themed Computer Applications, Economic and Business Statistics, Agro-climate, Applied Mathematics, E-Business, Entrepreneurship, and Communication. As for tacit knowledge consists of student experience in the academic field, student experience in the field of organization, student experience during the selection process for student admissions and student ideas for the development of academic and non-academic fields.
   Grouping conducted in this study consisted of 3 user categories, namely level II (lower category), level III (medium category) and level IV (upper category). The grouping with these user characteristics is based on the following criteria:

a. Level II (Lower Level)
   1) Lecture material received is still basic but has begun to be directed at each academic department.
   2) Has undergone education for 3 semesters so that understanding of academic life and organizational life on campus is still low and is still in the process of adjusting to the life of boarding houses on campus. In student organizations are still members as executors of decisions determined by the level above it.

b. Level III (Medium Level)
   1) The lecture material received is already more applicable than the previous level material. The knowledge that has been obtained has also increased and is sometimes in the form of case studies of problems that occur in the general world.
   2) Have been educated for 5 semesters and started to be actively involved in the management of student organizations such as the head of organizing student activities and other management. At the stage III level, an organizational decision can be made by reporting to the seniors and education providers.

c. Level IV (Upper Level)
   1) The course material received is complete from level I to level IV and is used as a rationale for the preparation of the final project as a condition for graduating college. The understanding and thoughts that have been received by level IV students are ready to be applied directly in the workforce later when they have graduated from college.
   2) Have been educated for 7 semesters and become a leader in student organizations. The bureaucratic relationship with the education provider becomes the responsibility of level IV so that everything in accordance with the activities carried out by students becomes the responsibility of level IV. Based on this, the mindset at the IV level is more comprehensive (comprehensive) when compared to the lower levels because of the experience he has gained during the educational process.

3. Develop Preliminary Form a Product
   The initial product design was done by creating an application that was placed on the localhost of the researcher's computer.
4. Design Validation
   Design validation is done by expert judgment, namely by giving questions to expert judgment.
5. Design Revision
   Design revisions made after making the initial product that is by providing rules for using the forum, how to use the forum (including writing, spoilers, videos and images) as well as changing the sub-category of SDA Management into a sub-category of Sustainable SDA Management to fit the latest curriculum applied at POLBANGTAN.
6. Hosting
   Making the product is done after the design revision and proceed with making hosting and domains that are registered with the hosting service provider. After

being registered with a hosting service, online forum sites can be accessed in general.

7. Preliminary Field Testing
   Limited trials are conducted at level III as a medium category grouping.
8. Main Product Revision / Delphi Technique I
   The revision of product design I was carried out after a limited trial, namely by answering the expert judgment team's questions when making hosting products, namely to access via mobile devices by considering aspects of responsive mode, namely:
   a) The wide display of online forums can cover all available menus while the length of online forums can be swiped up - down to see all posts.
   b) The display can be zoomed out and zoomed in if you want to clarify the writing.
   c) Users can also still write to online forums via mobile phones.
   d) All online forum features when accessed via mobile phones can still be used the same as accessing online forums via desktops or laptops.
   e) There are settings for the font size, type and display of the text (right aligned, left aligned, center or justify) when making writing so that the writing is comfortable to keep reading even if accessed via a mobile phone.
9. Main Field Testing
   Extensive trials were conducted at level II as a grouping of lower categories and level IV as a grouping of upper categories.
10. Final Product Revision / Delphi Engineering II
    The revision of product design II was carried out after extensive trials namely by revising the product in the form of deleting the profile category and adding cyber security categories and paying attention to aspects of the admin's role in managing and managing online forums so that online forums remain maximally accessible to each user.
11. Recommended Models
    The final product produced in this study is an online forum that aims to improve student knowledge management.
    The suggestions and impressions of users regarding the use of online forums in general from users are as follows:
    a) Online forums are generally good and help students in sharing knowledge between students both academically and non-academically.
    b) Online forums can be developed further in terms of appearance, android or desktop version and other supporting features such as online chat, giving good or bad ratings to users as well as adding categories and material.
    c) Online forum users can be expanded and utilized by other users besides students (such as alumni, practitioners, lecturers / instructors) so that the material contained in online forums is more varied.

To measure the effectiveness / feasibility of online forum based knowledge management products, a measurement model using the Online Learning Environment Survey (COLLES) method is conducted. Assessment in COLLES uses a *Likert* scale divided into 5 scales, namely Strongly Disagree = 1, Disagree = 2, Neutral = 3, Agree = 4, Strongly Agree = 5. The COLLES method is a questionnaire specifically aimed at finding out the level of comfort and the use of online learning system products (e-learning) by instructors and students in supporting the process of knowledge sharing so that it can be mass produced

(dissemination and implementation) (Sudjana, 2002). COLLES has three types of surveys, namely (1) Preferred Form which emphasizes the ideal opinion held by students, (2) Actual Form that asks the actual / real experience experienced by students, and (3) Combination of Preferred Form and Actual Form. In this research, the third form is a combination of Preferred Form and Actual Form so that all ideal and actual student opinions regarding online forums can be collected. COLLES consists of 24 questions divided into six categories where each category will describe the quality of using an online learning system.

The categories in the COLLES method are as follows:

- Relevance, to measure whether online learning is relevant to the scientific field and in accordance with the level of user knowledge.
- Reflection Thinking, to measure whether online learning stimulates users in thinking critical and open reflection in relation to online discussions between users.
- Interactivity, to measure the extent to which users can participate (interact) in the process of exchanging knowledge through e-learning systems.
- Support Tutor, to measure how the teacher / administrator plays a role in supporting users during the e-learning system.
- Peer Support, to measure whether in learning e-learning systems occur also support from fellow users in the process of teaching and learning activities.
- Interpretation, to measure whether the communication that occurs during the e-learning system is meaningful for each user.

Answers from respondents will be given a score based on assessment criteria from the Likert scale. In this study determined many interval classes of 5. The formula used according to Sudjana (2002), is as follows:

$$P = \frac{\text{Range}}{\text{Number of Classes}}$$

Where:
P = Length Class Intervals
Range = Largest Data - Smallest Data
Number of Classes = 5

Then the intervals of the assessment criteria are as follows:

$$P = \frac{5-1}{5}$$

$$P = 0,8.$$

We get the COLLES assessment criteria as follows:

Table 1
Assessment criteria COLLES method

Interval Value	Assessment Criteria
1,00 – 1,79	Worst (SBR) / Very Low (SR)

1,80 – 2,59	Bad (BR) / low (R)
2,60 – 3,39	Fair (CB) / Fair (CT)
3,40 – 4,19	Good (B) / High (T)
4,20 – 5,00	Excellent (SB) / Very High (ST)

Table 2
Results of the actual experience COLLES Method

Category	Question	Very Agree	Agree	Neutral	Disagree	Very Disagree	Total	Score	Average Score	Explanation
Relevance	Question 1	8	33	18	1	0	60	228	3.80	Good
	Question 2	19	35	5	1	0	60	252	4.20	Excellent
	Question 3	10	40	10	0	0	60	240	4.00	Good
	Question 4	19	32	9	0	0	60	250	4.17	Good
Reflection	Question 5	11	42	7	0	0	60	244	4.07	Good
	Question 6	14	36	10	0	0	60	244	4.07	Good
	Question 7	13	36	11	0	0	60	242	4.02	Good
	Question 8	14	36	10	0	0	60	244	4.07	Good
Interactivity	Question 9	12	42	6	0	0	60	246	4.10	Good
	Question 10	12	26	21	1	0	60	229	3.82	Good
	Question 11	9	19	28	4	0	60	213	3.55	Good
	Question 12	13	36	11	0	0	60	242	4.03	Good
Admin Support	Question 13	18	26	16	0	0	60	242	4.03	Good
	Question 14	15	34	11	0	0	60	244	4.07	Good
	Question 15	21	35	4	0	0	60	257	4.28	Excellent
	Question 16	21	36	3	0	0	60	258	4.30	Excellent
Fellow User Support	Question 17	14	37	8	1	0	60	244	4.07	Good
	Question 18	17	31	12	0	0	60	245	4.08	Good
	Question 19	20	34	6	0	0	60	254	4.23	Excellent
	Question 20	18	38	4	0	0	60	254	4.23	Excellent
Interpretation	Question 21	13	43	4	0	0	60	249	4.15	Good
	Question 22	12	38	10	0	0	60	242	4.03	Good
	Question 23	11	45	4	0	0	60	247	4.12	Good
	Question 24	11	42	7	0	0	60	244	4.07	Good
Average									4.07	Good

So based on these calculations, the results obtained 4.07 which are at Good intervals, which means students are comfortable and receive learning media in the form of online forums for learning tools for increasing Knowledge Management. Based on field research findings, results of data analysis, and reflections on every trial conducted. Research and Development produces recommended learning media, namely online forums for improving knowledge management among students.

Conclusion

The results of research on limited trials in third-level students regarding pretest and posttest on the use of online forums obtained pretest results of 44.86 and increased with the results of posttest 86.43. While the results of research on extensive trials in level II students regarding pretest and posttest on the use of online forums obtained pretest results of 47.43 and increased with the results of posttest 83.14. The results of research on extensive trials at level IV students regarding pretest and posttest on the use of online forums obtained pretest results of 45.71 and increased with 79.86 posttest results. To measure the impact using the COLLES method, the result is 4.07, which is in the Good interval, which means students are comfortable and accept learning media in the form of an online forum for learning tools to increase Knowledge Management. Based on

the results of research in the field, using the Research and Development method: to produce learning media, namely online forums, to increase knowledge management among students. The recommendations for further development are 1) Socialization of the products that have been produced, 2) Modification of the source code of the existing online forum application so that the appearance and use of online forums is more optimal, 3) Related to the management of online forums, it requires the manager (administrator and forum moderator)) to manage forums.

References

Altbach, P. G., & Balán, J. (Eds.). (2007). *World class worldwide: Transforming research universities in Asia and Latin America*. JHU Press.

Aryani, I. G. A. I., & Rahayuni, N. K. S. (2016). Innovation of teaching and learning english applied to animal sciences' student with the combination of computer media and audio visual. *International Journal of Linguistics, Literature and Culture*, *2*(1), 1-7.

Borg & Gall. (2003). Education Research. New York: Allyn and Bacon.

Budiarti, Y. (2015). Penerapan Knowledge Management System Pada E-Learning Dengan Metode COLLES Untuk Meningkatkan Hasil Belajar Siswa. *Indonesian Journal on Software Engineering*, *1*(1), 36-41.

Butnariu, M., & Milos, I. (2012). Preliminary assessment of knowledge management in universities. Procedia - Social and Behavioral Sciences 62 (2012) 791-795

Dave, B., & Koskela, L. (2009). Collaborative knowledge management—A construction case study. *Automation in construction*, *18*(7), 894-902. https://doi.org/10.1016/j.autcon.2009.03.015

Debowski, S. (2006). Knowledge Management. Milton: John Wiley & Sons.

Diniati, I., Komariah, A., & Kurniady, D. A. (2018). Implementasi Talent Management Dan Motivasi Kerja Implikasinya Pada Kinerja Pegawai Direktorat. *Jurnal Administrasi Pendidikan*, *25*(2), 294-306.

Esthi, R. B., & Sukmawati, A. (2011). Analisis Tingkat Penerapan Manajemen Pengetahuan Dalam Membangun Organisasi Berbasis Pengetahuan (Studi Kasus PT Trubus Mitra Swadaya SE-JABODETABEK). *Jurnal Manajemen dan Organisasi*, *2*(2), 134-153.

Fauzi, M. A., Tan, C. N. L., & Ramayah, T. (2018). Knowledge sharing intention at Malaysian higher learning institutions: The academics' viewpoint. *Knowledge Management & E-Learning: An International Journal*, *10*(2), 163-176.

Girard, J. P., Yerby, J., & Floyd, K. (2016). Knowledge retention in capstone experiences: An analysis of online and face-to-face courses. *Knowledge Management & E-Learning: An International Journal*, *8*(4), 528-539.

Honeycutt, J. (2000). Knowledge Management Strategies. Washington: Microsoft Press

Itkulova, L., Lukyanov, A., Bikmetov, E., Pushkareva, M., & Valiullina, Z. (2021). Scientific knowledge as a means and a prerequisite for discovering the essential powers of the individual. *Linguistics and Culture Review*, *5*(S4), 1085-1097. https://doi.org/10.21744/lingcure.v5nS4.1749

Juju, D., & Sulianta, F. (2013). *Kiat Sukses Menjadi IT Freelance*. Elex Media Komputindo.

Koh, J. H. L., Herring, S. C., & Hew, K. F. (2010). Project-based learning and student knowledge construction during asynchronous online discussion. *The Internet and Higher Education*, *13*(4), 284-291. https://doi.org/10.1016/j.iheduc.2010.09.003

Li, N., & Wu, D. D. (2010). Using text mining and sentiment analysis for online forums hotspot detection and forecast. *Decision support systems*, *48*(2), 354-368. https://doi.org/10.1016/j.dss.2009.09.003

Liao, S. H. (2003). Knowledge management technologies and applications—literature review from 1995 to 2002. *Expert systems with applications*, *25*(2), 155-164. https://doi.org/10.1016/S0957-4174(03)00043-5

Liebowitz, J. (2001). Knowledge management and its link to artificial intelligence. *Expert systems with applications*, *20*(1), 1-6. https://doi.org/10.1016/S0957-4174(00)00044-0

Ma, W. (2007). The flagship university and China's economic reform. *World class worldwide: Transforming research universities in Asia and Latin America*, 31-53.

Mariani, B., Ross, J. G., Paparella, S., & Allen, L. R. (2017). Medication safety simulation to assess student knowledge and competence. *Clinical Simulation in Nursing*, *13*(5), 210-216. https://doi.org/10.1016/j.ecns.2017.01.003

Marquardt, M. J. (2002). *Building the learning organization: Mastering the 5 elements for corporate learning*. Nicholas brealey publishing.

Metzler, J., & Woessmann, L. (2012). The impact of teacher subject knowledge on student achievement: Evidence from within-teacher within-student variation. *Journal of development economics*, *99*(2), 486-496. https://doi.org/10.1016/j.jdeveco.2012.06.002

Nainggolan, E. R. (2016). Tingkat Kenyamanan Pengguna Knowledge Management System dalam Mendukung Budaya Berbagi Pengetahuan Menggunakan Metode Colles. *Jurnal Khatulistiwa Informatika*, *4*(2).

Nilsook, P., & Sriwongkol, T. (2009). The development of multi-weblog with knowledge management for Thailand's higher education. In *2009 International Conference on Information and Multimedia Technology* (pp. 315-318). IEEE.

Nonaka, I., & Takeuchi, H. (1995). The knowledge-creating company. New York, NY: Oxford University Press.

Nyandra, M., Kartiko, B.H., Susanto, P.C., Supriyati, A., Suryasa, W. (2018). Education and training improve quality of life and decrease depression score in elderly population. *Eurasian Journal of Analytical Chemistry*, *13*(2), 371-377.

Pattnaya, J. (2017). Knowledge management in e-learning a critical analysis. *International Journal of Engineering and Computer Science, 6*(5), 21528–21533

Prestridge, S. (2010). ICT professional development for teachers in online forums: Analysing the role of discussion. *Teaching and Teacher Education*, *26*(2), 252-258. https://doi.org/10.1016/j.tate.2009.04.004

Ratnasari, A. (2012). Studi Pengaruh Penerapan E-learning Terhadap Keaktifan Mahasiswa dalam Kegiatan Belajar Mengajar Studi Kasus Universitas Mercu Buana Jakarta. In *Seminar Nasional Aplikasi Teknologi Informasi (SNATI)*.

Rozanda, N. E., Wahyuningsih, R., & Saide, S. (2017). Penerapan Knowledge Transfer Pada E-learning. In *Seminar Nasional Teknologi Informasi Komunikasi dan Industri* (pp. 318-326).

Rusli, R., Rahman, A., Ahmar, A. S., Musa, H., & Lince, R. (2021). Development of teaching materials for digital higher education in the industrial revolution 4.0

era. *Linguistics and Culture Review*, *5*(1), 361-366. https://doi.org/10.21744/lingcure.v5n1.1692

Saade, R., Nebebe, F., Mak, T., & Leung, N. K. (2011). Knowledge management systems development: Theory and practice. *Interdisciplinary Journal of Information, Knowledge & Management*, *6*.

Sari, W. K., & Tania, K. D. (2014). Penerapan knowledge management system (kms) berbasis web studi kasus bagian teknisi dan jaringan fakultas ilmu komputer universitas sriwijaya. *JSI: Jurnal Sistem Informasi (E-Journal)*, *6*(2).

Shaw, R. S. (2012). A study of the relationships among learning styles, participation types, and performance in programming language learning supported by online forums. *Computers & Education*, *58*(1), 111-120. https://doi.org/10.1016/j.compedu.2011.08.013

Shomirzayev, S. (2021). National followers in the students use of educational technologies instruction of interests. *International Journal of Linguistics, Literature and Culture*, *7*(3), 152-157. https://doi.org/10.21744/ijllc.v7n3.1508

SmitDev Community. (2007). Membangun Website dalam Sehari. Jakarta: PT. Elex Media Komputindo.

Songsangyos, P. (2012). The knowledge management in higher education in Chiang Mai: A comparative review. *Procedia-Social and Behavioral Sciences*, *69*, 399-403. https://doi.org/10.1016/j.sbspro.2012.11.426

Sudjana, N. (2002). *Metode Statistika. Bandung: Tarsito* (Doctoral dissertation, tesis pengaruh pembelajaran berbasis masalah dan kreativitas terhadap hasil belajar IPA. Bogor: Pasca sarjana Teknologi pendidikan Bogor).

Sugiyono, M. (2015). penelitian & pengembangan (Research and Development/R&D). *Bandung: Penerbit Alfabeta*.

Taylor, P., & Maor, D. (2000). Assessing the efficacy of online teaching with the Constructivist Online Learning Environment Survey.

Thongkoo, K., Panjaburee, P., & Daungcharone, K. (2019). A development of ubiquitous learning support system based on an enhanced inquiry-based learning approach. *International Journal of Mobile Learning and Organisation*, *13*(2), 129-151.

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 & E-Learning: An International Journal*, *11*(3), 304-324.

Zheng, W., Yang, B., & McLean, G. N. (2010). Linking organizational culture, structure, strategy, and organizational effectiveness: Mediating role of knowledge management. *Journal of Business research*, *63*(7), 763-771. https://doi.org/10.1016/j.jbusres.2009.06.005