Journal of Educational Technology
Studies and Applied Research

Vol. 01, No. 02, December 2024 *Available online at https://journal.teknologipendidikan.or.id/index.php/jetsar*

Knowledge Enhancement in a Web Learning Environment

Henry Praherdhiono[a], Ayami Nakaya[b], Taufik Ikhsan Slamet[a], Nunung Nindigraha[a]

[a] *State University of Malang, Indonesia*
[b] *Hiroshima University, Japan*
* Corresponding author: henry.praherdhiono.fip@um.ac.id

Abstract
This research is motivated by the limitations of time, cost, and energy in facilitating post-training learning. This research aims to develop a web-based knowledge management system design as a supplement to post-training independent learning. Application development adopts the SECI (Socialization, Externalization, Combination, and Internalization) model. The system will record data used as an indicator of decision-making, material presentation, and automatic recommendations for each participant. The method used in this study uses the Davidson-Shiver, Rasmussen, and Lowenthal development model which consists of 1) Analysis, 2) Evaluation Plan, 3) Simultaneous Design which includes design, system development, testing, limited implementation, and formative evaluation. 4) Full Implementation, and 5) Summative Evaluation and Research. There are two data analysis techniques, qualitative data analysis to measure the accuracy of utilization procedures; and quantitative data analysis to measure technical quality in the form of media validity and learning outcomes.

Keywords: Web Based Knowledge Management System, SECI model, Learning System Development

Introduction

Education and training (Diklat) are the process of fostering understanding and knowledge of a group about facts, rules, and methods that are organized by prioritizing coaching, honesty, and skills [1]. The implementation of training consists of several components such as participants, curriculum, methods, media, time, and learning process. The implementation of the training program at several training institutions is arranged in a tiered time frame consisting of the pre-(pre) to post-training stages. The flow of the training implementation process aims to optimize the results of training and mentoring. In general, pre-training activities aim to convey an overview of the material for the implementation of the training. Meanwhile, the post-training is in the form of mentoring as enrichment of the learning materials that have been delivered.

The success of the implementation of the Training is not only influenced by the stage of implementation of the Training, but also by the post-Training mentoring activities (Fitriyah, 2019). Currently, a variety of post-training activities can be in the form of online learning or learning through modules independently. However, these efforts have not been optimal. Some of the factors that cause this are limited time, place, and mentoring. The successful implementation of post-training learning through independent learning can be done by paying attention to the characteristics, needs, and abilities of each learner.

Given the importance of post-training learning, a strategy is needed that can be an alternative solution to achieve the goals of implementing the training. To overcome this, web-based distance learning can be an alternative solution (Falaq, 2020; Nugroho, 2024), but of course we must also consider the aspect of independent learning. Referring to research conducted by (Altınay et al., 2019; Khatun et al., 2021; Quarchioni et al., 2022; Silamut & Petsangsri, 2020) states that knowledge management has a significant role in web-based independent learning. So, the implementation of knowledge management (KM) as a strategy to determine the right steps related to the implementation of the post-training program. Broadly speaking, knowledge management is a system that is integrated with three elements, namely people, process, and technology. is an integrated system consisting of people, process, and technology. These three elements are pillars that cannot be separated and are interrelated with each other. Knowledge management (KM) is a process of identifying, finding, and disseminating intellectual assets for development and progress (Bratianu et al., 2021). The implementation of knowledge management widely used in improving the quality of human resources in a company and organization. This refers to how an organization's attitude in processing existing information or knowledge to become a strategic resource for everyone in the organization.

The application of knowledge management is based on knowledge classification that is spiral. The study of knowledge management, dividing knowledge into two types, namely tacit knowledge, and explicit knowledge (Agrawal & Mukti, 2020). Tacit knowledge is closely related to an individual's personal understanding of a phenomenon. Meanwhile, explicit knowledge is a set of knowledge that has been articulated into real and formal forms, such as books and articles. These two types of knowledge are crucial resources to develop the ability and potential of the organization in building its strategic moves.

ISSN 3062-9454 (online)
doi: https://doi.org/10.70125/jetsar.v1i2y2024a24

Application Knowledge management in learning, it does not replace the management of procedures related to tangible objects but helps to increase learner resources through the process of creating strategic steps. This is done starting from the process of knowledge creation, acquisition, transfer, transformation, and implementation (Dneprovskaya et al., 2020). The implementation of knowledge management in an organization has been widely considered effective in improving the professionalism of an organization. Astorga (2017) identified the role of KM through its implementation in a software engineering company (Astorga-Vargas et al., 2017). Researchers found that the implementation of KM is an effective step to help improve the quality and distribution of knowledge among employees in the company. The exchange of knowledge both formally and informally between developers helps each individual to improve their quality and significantly also the productivity of work as well as the performance of the company. Moreover (Frolova et al., 2021) also found that KM has significance and positive influence in developing creativity for entrepreneurship. This is done by applying a knowledge management model to build a practical model that can encourage individual motivation in developing a creative culture and continuing to learn. In addition, a business concept based on an approach to continuous learning will help the business survive in anticipation of other competitive strategies (Silamut & Petsangsri, 2020). The application of knowledge management in the education and training of an organization also shows a significant improvement in the employee self-learning process. Silamut and Petsangsri (2020) examine integration knowledge management which is supported using technology to open wider access for employees to improve digital literacy (Silamut & Petsangsri, 2020). It is also considered relevant to develop skills, including improving career paths. Knowledge management is a strategy, technology, and media that supports its implementation. The combination can help an organization develop and distribute knowledge and increase the competitive advantage of employees (Gao et al., 2016).

One of the commonly used models in knowledge management implementation is the SECI model. This process is known as Socialization, Externalization, Combination, and Internalization (SECI). The use of the SECI Model is important because it provides a more holistic view of how knowledge is created, transferred, and stored. The implementation of the SECI Model is in accordance with the rapid development of data and increasingly competitive knowledge.

Therefore, the use of the SECI Model can help organizations to create, transfer, and store knowledge more effectively, especially self-learning after training. The implementation of SECI in learning can be realized through the creation of adaptive progressive web application (PWA)-based applications on mobile and desktop devices. The use of the application is suitable for fact material, concept material, principal material, and procedural material. The design of a web-based knowledge management system aims to overcome the problems of learning styles, accessibility, mentoring, and learning personification. Based on the results of existing research and analysis of post-education and training needs, the author developed a Web-based Knowledge Management system design as a supplement to post-training self-learning. Thus, the post-training learning process can be conducted according to the needs and abilities of each learner.

The purpose of this development research is to produce a product in the form of a web-based knowledge management system design as a supplement to self-learning after training that is feasible, attractive, and effective.

Method

System development knowledge management web-based in this study applies the dominant Davidson-Shiver, Rasmussen, and Lowenthal models to web development. Thus, the selection of the model is in accordance with the characteristics of the research, namely the development of the system knowledge management web-based for training needs. Davidson-Shivers et al., (2018) describe web-based development as including several steps, namely: 1) Analysis, 2) Evaluation Plan, 3) Simultaneous Design which includes design, system development, trials, limited implementation, and formative evaluation. This phase is repeated indefinitely, 4) Full Implementation, and 5) Summative Evaluation and Research. In more detail, this development model can be described as follows:

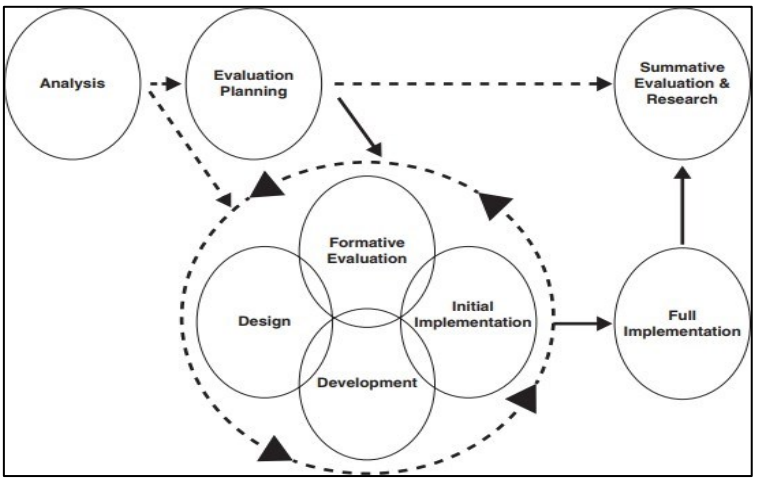

Figure 1 Web Based Instructional Design Development Model

At the analysis stage, there is an identification process of the need for components for implementation. There are several things that need to be done at this stage, starting from analysing the situation related to targets and contributors, product specifications developed, content, and the draft cost budget needed.

The evaluation planning stage specifically directs developers to plan formative evaluations and summative evaluations of knowledge management systems simultaneously. The aspects assessed include effectiveness, efficiency, and attractiveness. In this stage, the researcher also determines stakeholders and validators/reviewers related to the knowledge management system consisting of material experts, media experts, and training participants. In addition, this stage is a process of determining evaluation aspects, evaluation methods, locations, and times.

Simultaneous design is a continuous process between one component and another. At this stage, a series of activities are related and influence each other. There are four other stages, including: (1) Activity Planning: this stage begins with pre-planning activities that are conducted after the problem analysis is carried out. Initial planning to determine the need for the development of a web-based knowledge management system design. (2) Design: there are several things that are prepared at the design stage, namely the preparation of learning syntax design by applying the SECI (Socialization, Externalization, Combination, and Internalization) model, interaction design with users, and UI (User Interface) and UX (User Experience) design to create convenience in accessing the web. The SECI model itself is a continuous process related to the formation of tacit knowledge into explicit knowledge. (3) Development: translation of plans into finished products. Ideally, this stage is conducted several times to produce a quality product that is feasible to implement. (4) Limited Implementation: evaluates the developed system to determine the success of the development. Testing is conducted to determine technical obstacles such as access failures, delays, and smooth processes as well as bugs in the system. (5) Formative Evaluation: measures the weakness of the knowledge system web-based management that has been developed. The results of the analysis are used as a reference in product revisions. The evaluation process evaluates the validity of the product to media experts, material experts, and training participants.

End-to-End Implementation, more emphasis is placed on the relationship between aspects of facilities and maintenance. The thorough implementation stage can be conducted after going through the validation and improvement stages. The main aspects in this step are facilities and management. The implementation of the facility is applied to all participants. While the management aspect refers to website maintenance.

Summative evaluation is the final stage of the development of a web-based knowledge management system that is conducted over a specified time. The purpose of this stage determines the effectiveness of the product.

Findings & Discussion

The SECI model is a concept that describes the process of knowledge conversion in an organization. There are four main stages in this knowledge conversion process, namely Socialization, Externalization, Combination, and Internalization. The first stage, socialization, is a process in which tacit or unstructured knowledge is converted through interaction between individuals in the organization. The second stage, Externalization, is the stage where tacit knowledge is transformed into explicit or structured knowledge through the process of externalization. The third stage, Combination, is a stage where the structured knowledge is combined with other knowledge to create new, more complex knowledge. Finally, the Internalization stage is the process by which the explicit knowledge is internalized back into tacit knowledge by individuals in the organization. With this SECI model, the knowledge conversion process can be more directed and managed in an organization.

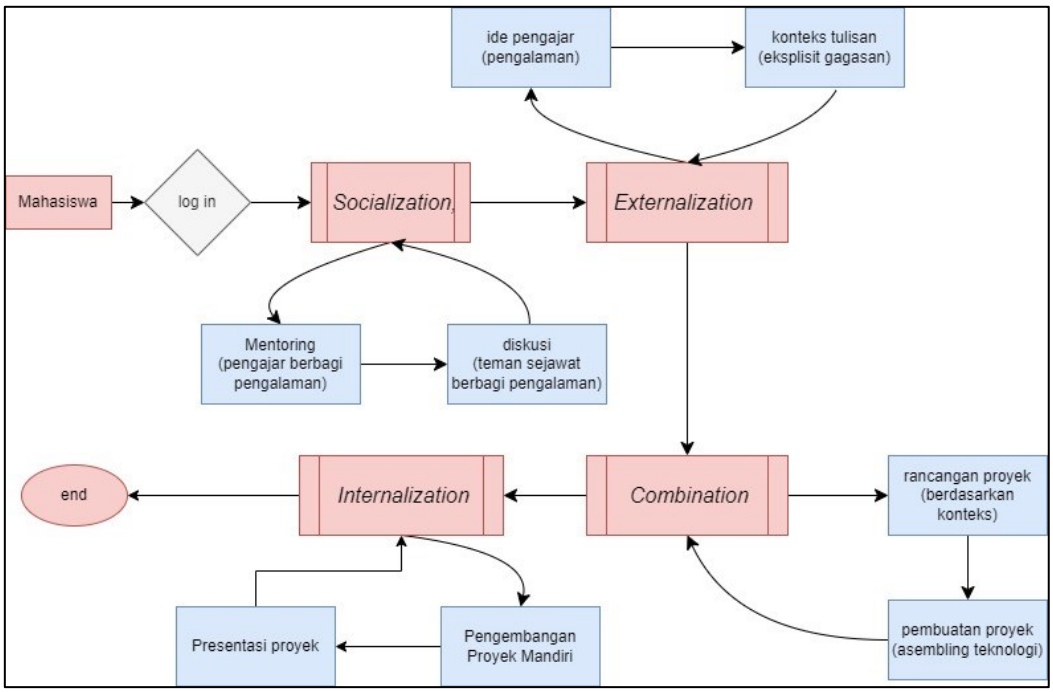

Figure 2 Developed SECI Learning Models

The socialization of tacit knowledge or unspoken knowledge is an important process in the transfer of knowledge among individuals. Implicit knowledge such as experience and intuition are often difficult to express verbally, but it can be shared through direct interaction between individuals. This method of socialization can occur in several ways, such as mentoring, coaching, or through teamwork. In the context of mentoring, an individual who has more tacit knowledge can share his or her experience with other individuals through direct interaction and mentorship. Likewise in coaching, where a coach can help individuals to explore their tacit knowledge through discussions and practice. In addition, team cooperation can also be an effective forum for sharing knowledge between team members, thus creating an environment that supports indirect knowledge exchange. Thus, the socialization of tacit knowledge is one of the effective ways to expand and enrich knowledge in an organization or community.

The implementation of socialization is conducted in a structured system through several methods. One of them is through mentoring, where teachers directly share their experience and knowledge with students. With mentoring, it is hoped that students can gain a deeper understanding of a certain topic or skill. In addition, the socialization method is also conducted through discussions, where students interact with peers to share experiences and perspectives. Through discussions, it is hoped that students can expand their horizons and understanding of a certain topic through dialogue and productive exchange of ideas. Thus, the implementation of this socialization is expected to provide maximum benefits for the academic and personal development of students.

Externalization is the process of transforming implicit knowledge into an explicit form, such as in the form of writing, drawings, or models. This process allows knowledge that was previously indirectly stored in a person's mind to be expressed and shared with others in a clear and structured manner. By externalizing, individuals or organizations can take knowledge that was previously only possessed by a few people and communicate it to others more broadly. This can help in clarifying mutual understanding, speeding up the learning process, and allowing for further knowledge development through collaboration and discussion. Thus, externalization has a significant role in supporting the dissemination and development of knowledge in various fields.

The implementation of Externalization is conducted with a structured approach, starting from the idea of the teacher who is raised as the starting point of the socialization process. These ideas come from the experience of the teachers which are then socialized to related parties. Furthermore, the ideas that have been socialized will be further elaborated in the context of more detailed writings or documents. This process aims to ensure that the ideas that have been conveyed can be conveyed clearly and accessible to the parties involved. Thus, the implementation of Externalization is an important first step in ensuring a comprehensive understanding of the ideas that are to be conveyed and implemented in a broader context.

Combination (Explicit to Explicit) refers to the merger, improvement, or development of existing explicit knowledge into new, more complex, or more useful forms. This process involves systematically and systematically combining existing information to create new, more valuable knowledge. In a business context, this combination of types of knowledge can occur when organizations integrate data and information from various sources to create new insights that can be used to make better decisions. In addition, combinations can also occur when an organization improves or develops existing explicit knowledge

through a careful process of analysis, synthesis, and evaluation. Thus, the combination of explicit knowledge is a crucial factor in efforts to improve the efficiency and effectiveness of the organization through the optimal use of available information.

The implementation of the Combination is conducted in a structured and planned way. First, students will start by designing a project based on the context that has been given. In this stage, they will conduct an in-depth analysis of the project's needs and formulate a comprehensive plan. After the project design is prepared, the next step is to create a project or assembling technology. Here, students will combine a variety of technologies that are relevant and appropriate to the needs of the project to realize the desired result. This process requires a deep understanding of the various technologies available as well as the ability to integrate them synergistically. Thus, the implementation of this combination can provide valuable experience for students in developing technical skills and problem solving holistically.

The internalization process is an important process in transforming explicit knowledge into implicit knowledge. This is done through direct experience that helps a person to understand and apply this knowledge indirectly. With internalization, one can develop a deeper understanding and be able to use that knowledge without having to explicitly remember every detail. This process can occur through various means, such as hands-on practice, observation, or interaction with the surrounding environment. Thus, knowledge that is initially only known explicitly can become an inherent part of a person and is able to be used implicitly in various situations. Thus, internalization plays a significant role in the formation of one's knowledge and skills.

The implementation of internalization is conducted through two main stages. First, students are expected to be able to develop projects independently based on the designs that have been made. In this stage, students are expected to be able to show their ability to apply the concepts that have been learned during the educational process. Second, students are asked to present the results of their projects as a form of their understanding of the material that has been studied. Through this project presentation, it is hoped that students will be able to comprehensively explain the concepts, methodologies, and results that have been achieved in the projects they have worked on. Thus, the implementation of this internalization is expected to be tangible evidence of students' understanding of the material that has been learned and their ability to apply this knowledge in real situations.

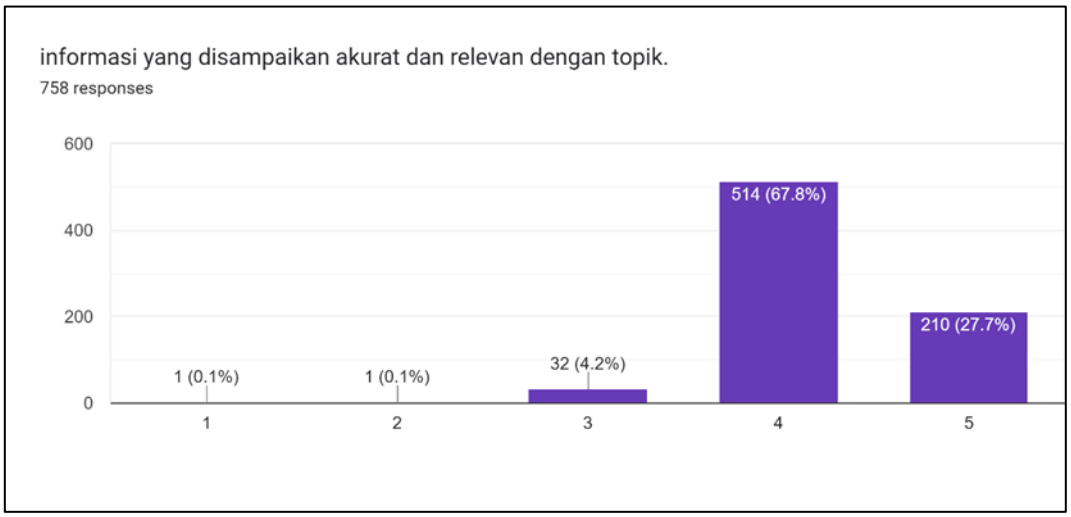

Figure 3 Assessment Results in Information Comprehension

Based on the data presented in the graph, it can be concluded that most respondents (67.8%) have excellent ability to socialize information. This shows a prominent level of confidence in conveying accurate and relevant information. However, there are some respondents (27.7%) who claim to have good skills, indicating that there is still a proportion that feels the need to improve their skills in this regard. Very few respondents (less than 5%) stated that they had low or extremely low ability. This indicates that in general, the ability to disseminate information in this group of respondents is quite adequate. Thus, it can be concluded that most respondents feel confident in their ability to socialize information, but there are still a small number that need to be improved in this regard. The graph uses the Likert measurement scale, where a value of 1 indicates an extremely low level of ability, and a value of 5 indicates a remarkably prominent level of ability. Thus, the distribution of respondents' answers can provide a clear picture of the level of information dissemination ability in the group.

Based on the results of this assessment, it can be concluded that most respondents have good skills in disseminations information. This is a strength that can be an important capital in improving the quality of learning. However, even though most of the respondents have shown good skills, efforts are still needed to continue to improve the ability to disseminate information to all respondents. Therefore, the focus of development can be directed to the group of respondents who have a score of 3 (good) and 2 (adequate). Development activities that can be conducted include training, workshops, or assignments that require higher socialization skills. Thus, it is hoped that the ability to disseminate information from all respondents can continue to be

improved. In addition, it is also necessary to conduct periodic evaluations to see the development of information dissemination capabilities after interventions. This evaluation is important to ensure that the development efforts conducted have had a significant impact in improving the information dissemination ability of the respondents. With continuous development and evaluation efforts, it is hoped that the ability to disseminate information from all respondents can continue to improve. This will have a positive impact on the overall quality of learning.

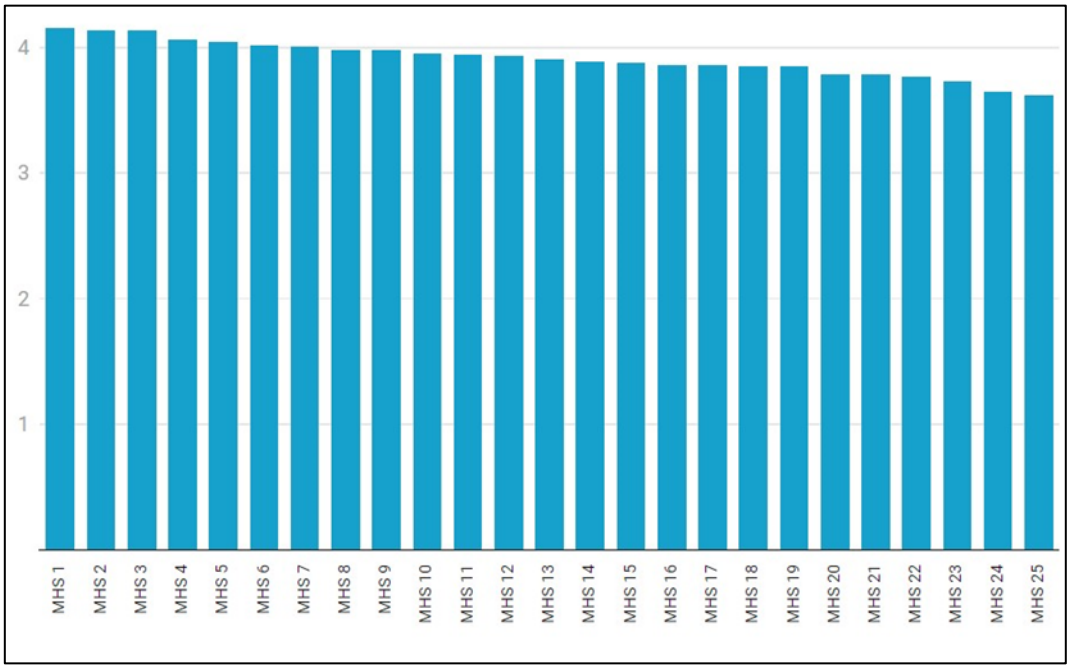

Figure 4 Peer Assessment Results

Based on the score range between 3 to 4, it can be concluded that the dissemination ability of student projects in general is considered quite good to particularly good by their peers. This shows that students have adequate abilities in presenting their projects to their peers. However, there was a significant individual variation in the scores obtained. Some students scored higher than others, indicating differences in abilities in terms of project dissemination. The score distribution that shows that most students score above average (3) indicates that most students have sufficient ability to convey their projects to their peers. This is a positive indication of the overall dissemination ability of student projects. Nevertheless, it is necessary to continue to encourage and support students in improving their project dissemination skills. With significant individual variation, it is necessary to take a diverse approach in providing support and coaching to students. This can be done through training, mentoring, and the development of better communication skills. Thus, it can be concluded that while in general the dissemination ability of student projects is considered quite good, there is room for improvement that can be made through diverse and sustainable approaches. Appropriate support and coaching will help students hone their project dissemination skills, so that they can have a wider and positive impact in the academic and professional environment in the future.

After assessing the programs or learning that have been conducted, it can be concluded that in general, the program is quite effective in developing the ability to disseminate student projects. However, further efforts need to be made to help students who get below-average scores. Supervisors or lecturers can provide more specific and comprehensive feedback to these students to improve their abilities. By further analysis, we can identify the strengths and weaknesses of each student in terms of project dissemination. This information can be used to develop a more targeted development program. Training or workshops can also focus on specific skills that still need to be improved, such as presentation skills, effective use of language, or mastery of visual media. This peer assessment process needs to be conducted periodically to monitor the development of students' abilities and adjust the ongoing learning program. Thus, it is hoped that the learning program can continue to develop and have a positive impact on the ability to disseminate student projects. In this case, the role of supervisors or lecturers is important in providing guidance and support to students. With the right support, it is hoped that the dissemination ability of student projects can continue to improve. Continuous evaluation can also be the foundation for the improvement and development of learning programs in the future. Thus, it is hoped that through these efforts, students can develop better project dissemination skills and become better prepared to face challenges in the real world.

In the context of peer assessment, the score obtained by students shows the extent of their ability to share knowledge and experience with their peers. A high score indicates that students have successfully disseminated their ideas and project results effectively and are able to make a meaningful contribution in the academic environment. This also reflects that students have been able to conduct the socialization stage in the SECI model well, where they are able to share tacit (implicit) knowledge through direct interaction with peers. The implication of this is the ability of students to transfer knowledge effectively, both in

tacit and explicit form, which is important in the development of science and skills. Thus, peer assessment is one of the important indicators in evaluating students' ability to contribute to the academic and social environment.

In the context of peer assessment, high scores indicate students' ability to articulate their ideas clearly and structured. This indicates that students can convey their thoughts well and are easily understood by others. The ability to convert tacit knowledge into an explicit form, such as in a presentation or report, indicates success in the externalization stage. Thus, a high score also reflects the success in the SECI (Socialization, Externalization, Combination, Internalization) process in transferring knowledge effectively. Therefore, the ability to express ideas in a clear and structured manner has important implications in the context of knowledge development and scientific communication. Thus, this shows that students have succeeded in transforming tacit knowledge into a form that can be accessed by others through various communication media.

The results of the peer assessment can be an indicator of students' abilities in the combination stage, although the assessment does not directly measure these abilities. A high score in peer assessment can indicate that students are able to combine ideas and information in their projects. This is consistent with the implications of SECI, where the ability to combine ideas and information is one of the indicators of the success of the combination stage in the SECI model. Therefore, it is important for educational institutions to provide adequate support and training to students so that they can develop these combination abilities. Thus, students will be able to become professionals who are able to integrate knowledge from various sources and make valuable contributions in their work environment.

In the context of learning, peer assessment is an important indicator in measuring the level of internalization of students' knowledge and skills. A high score in peer assessment indicates that students have successfully internalized the concepts taught during the learning process. This indicates that students can understand and apply this knowledge in different contexts and are able to communicate their understanding well to their peers. The implication of SECI from students' ability to present their projects well is that they have managed to form explicit knowledge from collective experience and are able to internalize it into themselves. Thus, the ability to present a project well not only shows a deep understanding, but also the ability to apply that knowledge in real-life situations. Therefore, SECI peer assessment and implications have a significant role in evaluating and developing students' ability to internalize knowledge and skills.

Conclusion

The results of the peer assessment can be an indicator of students' abilities in the combination stage, although the assessment does not directly measure these abilities. A high score in peer assessment can indicate that students are able to combine ideas and information in their projects. This is consistent with the implications of SECI, where the ability to combine ideas and information is one of the indicators of the success of the combination stage in the SECI model. Therefore, it is important for educational institutions to provide adequate support and training to students so that they can develop these combination abilities. Thus, students will be able to become professionals who are able to integrate knowledge from various sources and make valuable contributions in their work environment.

In the context of learning, peer assessment is an important indicator in measuring the level of internalization of students' knowledge and skills. A high score in peer assessment indicates that students have successfully internalized the concepts taught during the learning process. This indicates that students can understand and apply this knowledge in different contexts and are able to communicate their understanding well to their peers. The implication of SECI from students' ability to present their projects well is that they have managed to form explicit knowledge from collective experience and are able to internalize it into themselves. Thus, the ability to present a project well not only shows a deep understanding, but also the ability to apply that knowledge in real-life situations. Therefore, SECI peer assessment and implications have a significant role in evaluating and developing students' ability to internalize knowledge and skills.

Declarations and Statements

Acknowledgements
The authors report there are no acknowledgements to declare.

Authors Contributions
First Author: Conceptualization, Methodology, Data Collection, Writing - Original Draft. *Second Author*: Methodology, Review, Supervision, Review & Editing. *Third & Forth Author:* Review, Proofreading, Supervision.

Funding
The authors do not report specific grant from any funding agency.

Data availability
The participants of this study did not give written consent for their data to be shared publicly, so due to the sensitive nature of the research supporting data is not available.

Competing Interest
The authors report there are no competing interest to declare.

References

Agrawal, A., & Mukti, S. K. (2020). Knowledge Management & It's Origin, Success Factors, Planning, Tools, Applications, Barriers and Enablers: A Review. *International Journal of Knowledge Management*, *16*(1), 43–82. https://doi.org/10.4018/IJKM.2020010103

Altınay, F., Altınay, M., Dagli, G., & Altınay, Z. (2019). A study of knowledge management systems processes and technology in open and distance education institutions in higher education. *The International Journal of Information and Learning Technology*, *36*(4), 314–321. https://doi.org/10.1108/IJILT-02-2019-0020

Astorga-Vargas, M. A., Flores-Rios, B. L., Licea-Sandoval, G., & Gonzalez-Navarro, F. F. (2017). Explicit and tacit knowledge conversion effects, in software engineering undergraduate students. *Knowledge Management Research & Practice*, *15*(3), 336–345. https://doi.org/10.1057/s41275-017-0065-7

Bratianu, C., Stanescu, D. F., & Mocanu, R. (2021). Exploring the Knowledge Management Impact on Business Education. *Sustainability*, *13*(4), 2313. https://doi.org/10.3390/su13042313

Davidson-Shivers, G. V., Rasmussen, K. L., & Lowenthal, P. R. (2018). *Web-Based Learning*. Springer International Publishing. https://doi.org/10.1007/978-3-319-67840-5

Dneprovskaya, N. V., Komleva, N. V., & Urintsov, A. I. (2020). The Knowledge Management Approach to Digitalization of Smart Education. In Z. Hu, S. V. Petoukhov, & M. He (Eds.), *Advances in Artificial Systems for Medicine and Education II* (Vol. 902, pp. 641–650). Springer International Publishing. https://doi.org/10.1007/978-3-030-12082-5_58

Falaq, F. I. (2020). *Pengembangan sumber belajar terbuka berbasis web pada pelatihan kader pergerakan mahasiswa islam Indonesia di Komisariat Sunan Kalijaga Kota Malang / Fitrah Izul Falaq* [Diploma, Universitas Negeri Malang]. https://repository.um.ac.id/230732/

Fitriyah, R. N. (2019). Implementasi Transfer Pembelajaran dalam Diklat. *Jurnal Edutrained : Jurnal Pendidikan Dan Pelatihan*, *3*(2), 165–176. https://doi.org/10.37730/edutrained.v3i2.9

Frolova, Y., Alwaely, S. A., & Nikishina, O. (2021). Knowledge Management in Entrepreneurship Education as the Basis for Creative Business Development. *Sustainability*, *13*(3), 1167. https://doi.org/10.3390/su13031167

Gao, Y., Liu, T.-C., & Paas, F. (2016). Effects of mode of target task selection on learning about plants in a mobile learning environment: Effortful manual selection versus effortless QR-code selection. *Journal of Educational Psychology*, *108*(5), 694–704. https://doi.org/10.1037/edu0000080

Khatun, A., George, B., & Dar, S. N. (2021). Knowledge Management Practices in the Higher Education Sector with Special Reference to Business Schools. *Education & Self Development*, *16*(2), 47–59. https://doi.org/10.26907/esd.16.2.04

Nugroho, R. P. N. (2024). *Pengembangan learning management system dengan pendekatan gamifikasi untuk pembelajaran berbasis proyek / Rengga Prakoso Nugroho* [Diploma, Universitas Negeri Malang]. https://repository.um.ac.id/305639/

Quarchioni, S., Paternostro, S., & Trovarelli, F. (2022). Knowledge management in higher education: A literature review and further research avenues. *Knowledge Management Research & Practice*, *20*(2), 304–319. https://doi.org/10.1080/14778238.2020.1730717

Silamut, A., & Petsangsri, S. (2020). Self-directed learning with knowledge management model to enhance digital literacy abilities. *Education and Information Technologies*, *25*(6), 4797–4815. https://doi.org/10.1007/s10639-020-10187-3