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Enhancing Curriculum Management through Lesson Study: Insights from the SECI Knowledge Creation Model

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Abstract

21st-century curriculum development is crucial to prepare students for a rapidly changing world. The OECD and UNESCO have published several papers recommending strategies for curriculum development; however, implementing a 21st-century curriculum faces challenges in teacher professional development and curriculum design due to limited time and resources. This paper reports a case study about a school implementing a lesson study to address the challenges of implementing the 21st-century curriculum. The study was guided by the SECI knowledge creation model, which served as a framework for the development and execution of lesson study activities. The study used a qualitative research approach, employing interviews and observations to collect data. Participants included the school's teachers and administrators who engaged in lesson study over two years. Results of the study revealed that using lesson study and the SECI model positively impacted the school's ability to implement the 21st-century curriculum. Teachers reported increased collaboration and shared understanding of the curriculum's objectives, leading to more effective lesson planning and improved student outcomes. Additionally, the SECI model facilitated the creation and sharing of new knowledge, leading to greater innovation and creativity in the classroom. The study's conclusion suggests that Lesson Study and the SECI model can effectively address the challenges of implementing the 21st-century curriculum. By fostering collaboration, shared understanding, and knowledge creation, lesson study can facilitate the development of innovative and effective teaching practices that support student success in a rapidly changing world. The study recommends that schools adopt lesson study and the SECI model to implement the 21st-century curriculum.

Keywords: *Lesson study, Curriculum management, the SECI model*

1. Introduction

The 21st-century curriculum development is essential for preparing students for the rapidly changing world they will face. In the past, education focused mainly on the three Rs - reading, writing, and arithmetic - but now, students need to develop skills beyond these basics. A modern curriculum must be comprehensive and inclusive, considering all students' needs, regardless of their backgrounds or abilities. It must incorporate emerging technologies, critical thinking, problem-solving, creativity, and collaboration. The curriculum must also reflect the diverse and globalized world, preparing students for careers that may not yet exist. Overall, 21st-century curriculum development is critical to ensure students have the skills and

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knowledge to succeed. The Organization for Economic Cooperation and Development (OECD) and the United Nations Educational, Scientific and Cultural Organization (UNESCO) have recognized this importance and have published several papers recommending strategies for curriculum development in the 21st century. The OECD's report "The Future of Education and Skills: Education 2030" emphasizes the need for a broad and holistic curriculum that includes traditional academic subjects but also social and emotional learning and digital literacy [1]. UNESCO's "Global Citizenship Education: Topics and Learning Objectives" recommends that curricula be designed to promote critical thinking, empathy, and global awareness to prepare students for a diverse and interconnected world [2].

Implementing a 21st-century curriculum in schools faces challenges in teacher professional development and curriculum design. Teachers need to be trained to deliver 21st-century skills to their students. However, providing professional development opportunities for teachers is a challenge, given the limited time and resources available. Darling-Hammond et al. [3] state that creating a professional learning system that aligns with the requirements of the new learning environment and promotes continuous, job-embedded learning for educators is crucial to support effective 21st-century teaching and learning. Recent studies have revealed a gap between the expected teaching skills and essential teaching skills necessary for implementing the curriculum, highlighting the need for knowledge of effective teacher professional development activities among the case school leaders and teachers to bridge this competence gap and establish a sustainable institutional mechanism for curriculum management [4][5]. Designing a 21st-century curriculum that effectively integrates core content areas with 21st-century skills is challenging. Griffin et al. [6] contend that creating a 21st-century curriculum necessitates a novel approach to curriculum design that places significant emphasis on integrating core content areas with 21st-century skills like critical thinking, problem-solving, communication, collaboration, creativity, and digital literacy. Incorporating elements of the 21st-century curriculum is a critical challenge facing schools today, requiring implementation within, across, and beyond existing subject curricula.

The introduction of the Learning to Learn 2.0+ curriculum in Hong Kong [7][8] has emphasized the need for regional schools to enhance their curriculum management capacity. This ongoing renewal of the school curriculum aims to enhance students' learning-to-learn capabilities, promoting effective lifelong learning. However, successfully implementing such reforms relies on building professional competencies among educators and teachers within the school organization [4]. This new curriculum has posed significant challenges for implementation and lesson design at various levels. To successfully navigate this ongoing renewal of school curriculum, it is essential to incorporate a wide range of cross-curricular activities that encompass Science, Technology, Engineering, and Mathematics (STEM) education, information literacy, Language/Reading across the curriculum, values education, and e-learning [7] p.6. In line with this, the study reports on a school-level Lesson Study adopting the SECI (socialization-externalization-combination-internationalization) model of knowledge creation [9] as a guiding framework to enhance student learning. The SECI model emphasizes the importance of creating and sharing knowledge within the school organization to enhance the effectiveness and sustainability of the curriculum.

2. Literature review

2.1. Lesson study

Lesson study is a professional development strategy that originated in Japan and is increasingly being adopted by schools worldwide to improve teaching and learning. It involves a collaborative process in which teachers plan, observes, and analyzes lessons to improve student learning. Lesson study is effective in helping schools address the challenges of implementing the 21st-century curriculum in several ways. First, lesson study promotes a culture of collaboration and continuous improvement, essential for implementing the 21st-century curriculum. As Lewis [10] noted, Lesson Study provides a platform for teachers to share their expertise, identify areas of strength and areas that need improvement, and collectively develop solutions to improve student learning outcomes. Second, lesson study helps teachers understand the content and pedagogy required to teach the 21st-century curriculum. By working together to plan and teach lessons, teachers can engage in professional learning to explore new teaching strategies and develop a deeper understanding of their teaching content. As noted by Cheng [5], Lesson Study can help teachers develop a deeper understanding of the knowledge, skills, and dispositions students need to succeed in the 21st century. Third, lesson study provides opportunities for teachers to engage in reflective practice and to make informed decisions about curriculum and instruction. By analyzing student learning data and reflecting on their teaching practice, teachers can identify areas for improvement and make data-informed decisions about curriculum and instruction. Lesson Study is an effective approach to curriculum management that promotes collaboration, reflection, and continuous improvement [11][12]. It helps teachers to create a shared understanding of the curriculum and to develop pedagogical expertise.

2.2. The SECI model

Cheng [5] conceptualizes Lesson Study as an across-subject curriculum management tool by using the SECI model as a conceptual lens. The SECI model represents a two-dimensional matrix that outlines four potential scenarios for the interaction or conversion of tacit and explicit knowledge, as illustrated in [Figure 1]. This model entails four distinct knowledge conversion processes: socialization, externalization, combination, and internalization. These processes are part of a continuous knowledge conversion cycle progressing in an ascending spiral. Through these four modes of knowledge conversion, educators can facilitate a dynamic process for retaining, transferring, and creating pedagogical content knowledge to address across-subject curricula.

Socialization Individual teachers share their views on goals and identify useful skills for developing lesson plans that can be adapted into their practice.	**Externalization** Each subject department holds meetings to develop its departmental teaching and learning plans regarding the subject-level teaching objectives.
Internalization Teachers analyze the objective of the lesson study and prepare lesson plans, thus internalizing the knowledge through teaching practices.	**Combination** Teaching and learning plans from departments are combined into the annual school-level teaching and learning plan, which will be documented and distributed to individual teachers for implementation.

Figure 1. The SECI curriculum management cycle

Socialization is the process of transferring implicit knowledge from one individual to another. In the school context, this can occur through interactions with the environment and through sharing time and space with others, allowing for sharing of individual tacit knowledge among several teachers. Tacit knowledge related to curriculum management and teaching can be created when it interacts with other tacit knowledge. For instance, novice teachers can learn from experienced teachers in a mentoring system, leading to a socialization process [13]. Similarly, a group of teachers in a collective learning process can design and evaluate lesson plans to enhance student learning, allowing for the sharing and co-construction of individual teachers' tacit knowledge through interaction [14]. Participating in designing and evaluating lesson plans is an example of a socialization process that facilitates the sharing of implicit knowledge among teachers.

Externalization refers to transforming tacit knowledge into explicit knowledge, which involves capturing knowledge from dialogue or other sources and recording it in documents [9] p.71. In education, knowledge externalization is converting tacit knowledge into explicit concepts through a collaborative effort within a subject department. This process involves explicit pedagogical content knowledge and expressing it through analogies, concepts, hypotheses, or models in lesson plans or unit plans. Through externalization, individual teachers' tacit pedagogical content knowledge can be transformed into explicit knowledge using language and images. When collaborating on a lesson plan, teachers' tacit knowledge can be externalized and transformed into Pedagogical Content Knowledge (PCK) for a subject department or key learning area. This process can help clarify ambiguous teaching ideas that may be unclear when they exist only in an individual teacher's mind. Externalization is articulating tacit knowledge into explicit knowledge by converting dialogue into text records and codifying tacit knowledge into documents [9] p.71. In schools, knowledge externalization articulates tacit knowledge into explicit concepts within a subject department, thereby creating new knowledge. This process enables tacit pedagogical content knowledge to become explicit and expressed as analogies, concepts, hypotheses, or models in a lesson or unit plan. Through externalization, individuals' accumulated tacit pedagogical content knowledge can be converted into explicit knowledge via language and images. In collaborative lesson planning, teachers' tacit knowledge converted into explicit knowledge can be developed into the Pedagogical Content Knowledge (PCK) of a subject department or a key learning area. As a result, ideas for teaching that may have been ambiguous in individual teachers' minds become clearer and more focused, as they can be objectively understood through teaching materials, lessons, and unit plans. This process often leads to the generation of new ideas for curriculum implementation.

Combination refers to the process of converting explicit knowledge from various groups or departments into more usable organizational knowledge to address the major concerns of the development plan. Knowledge combination is a deliberate design process that involves producing specific knowledge from concepts and an analytical process that combines data, information, and knowledge to generate semantic knowledge. In the knowledge combination process, concepts are integrated through rational and logical thought to produce new and more comprehensive knowledge, eliminating contradictions. Nonaka and Takeuchi [9] p.73 define combination as systematically integrating knowledge into an organizational knowledge system as a knowledge asset. Effective curriculum implementation requires creating knowledge through this process across different departments as they co-create and elicit higher-level school knowledge. However, the combination process is the most challenging in any organization. It requires an organizational learning culture that promotes communication and knowledge sharing among different departments and a shared vision of constructing and

combining knowledge for organizational development. Without a powerful "systems thinking" competency, knowledge cannot be easily combined or applied in different departments to achieve common organizational tasks or deal with major concerns.

Internalization is when an individual assimilates and internalizes explicit knowledge that the organization collectively holds. This mode transforms organizational knowledge that has been externalized into an individual's tacit knowledge. The formal knowledge created by the organization's combination process is continually reconstructed through practice and individual interpretation, combined with personal circumstances and other knowledge. This results in accepting new "tacit knowledge" through the internalization process. Internalization is not just a matter of practice but should also be approached subjectively and consciously. The process of knowledge internationalization involves the concept of "learning by doing," where an individual learns explicit organizational knowledge through professional practices [9] p.78. Knowledge is incorporated into an individual through internalization, which converts explicit knowledge into tacit knowledge. The teachers who enact the lesson plan and explicit teaching theories can understand and absorb the explicit knowledge and internalize the tacit knowledge through enacting the lesson plan. Tacit knowledge is accumulated by actually doing or through simulations. Enacting the lesson plan is an internalization process that transfers the school or team's explicit knowledge to the individual. As teachers apply the knowledge shared in Lesson planning to their teaching practices, the explicit knowledge is internalized as personal knowledge [15].

The SECI model emphasizes the importance of socialization in creating knowledge, which means the team should engage in dialogue and discussion to ensure the learning goals are clear and shared among all members when conducting a Lesson Study. Developing lesson plans or unit plans involves the knowledge externalization process of the SECI model, which emphasizes the need to articulate tacit knowledge into explicit knowledge. During the teaching phase, the team should observe the Lesson and collect data on student learning. Reflect on the Lesson in conducting a Lesson Study involves the knowledge combination phase of the SECI model, which emphasizes the need to combine explicit knowledge into new knowledge. Fernandez and Yoshida argue that reflection plays a vital role in Lesson Study since it enables the team to analyze the data collected during the lesson and make necessary adjustments to enhance future instruction [16]. During the reflection phase, the team should engage in dialogue and discussion to analyze the data and identify areas for improvement. The final step in conducting a Lesson Study is to share the Lesson and findings with other teachers in the school or district. This step involves the internalization process of the SECI model, which emphasizes the need to internalize new knowledge in teaching. Lewis and Hurd assert that sharing the lesson and findings is a crucial aspect of Lesson Study, as it enables fellow teachers to derive benefits from the knowledge generated by the team [17]. The SECI process facilitates the conversion of tacit knowledge into explicit knowledge, which can be shared and applied to improve curriculum design and delivery. The SECI knowledge management model can be leveraged to bridge the knowledge gap and support effective curriculum management.

2.3. Curriculum management

Hong Kong schools must define their primary concerns and create strategic plans for curriculum and teaching. However, a significant gap often exists between the expected curriculum implementation pedagogy and teachers' knowledge. Additionally, many schools use top-down approaches that lack sustainability and fail to externalize or transfer individual

teachers' tacit (PCK) and curriculum knowledge within the organization. To address this challenge, an innovative knowledge management strategy is needed to enhance the opportunities for creating effective pedagogy and curriculum designs when implementing the Learning to Learn 2.0+ curriculum in schools. This study adopts Nonaka's SECI (Socialization, Externalization, Combination, and Internalization) knowledge creation model [9] as a guiding framework to design project activities that bridge the gaps and institutionalize the curriculum management mechanism.

3. Research methodology

3.1. Research design

This research adopted a case study approach to explore how a school conducts a Lesson Study that adopted the SECI knowledge creation model as a guiding curriculum framework to address the challenges of implementing the 21st-century curriculum in schools. The study aims to investigate the impact of the lesson study and the SECI model on teachers' professional development and student learning outcomes. The researcher used qualitative research methods to collect data for this study, including interviews, lesson observations, and lesson plan reviews. Semi-structured interviews were conducted with teachers who participated in the Lesson Study to explore their experiences and perspectives on the process and impact of the SECI model. Lesson observations were carried out to observe the implementation of the SECI model in the classroom, and lesson plans were reviewed to examine the integration of 21st-century skills in the curriculum. Field notes were taken throughout the Lesson Study to explore if the PCK is shared or developed to address the curriculum implementation gaps.

3.2. Case selection

The case school was selected as the case school for this study because it is a typical secondary school in Hong Kong facing similar challenges as other schools in terms of curriculum implementation and teacher professional development. The school has recently adopted the Learning to Learn 2.0+ curriculum and is designing its curriculum and teaching plans to align with the new curriculum framework. The selection of the school is also based on its willingness to participate in this study, its accessibility and availability of data, and its potential to contribute to the knowledge-creation process through collaboration with the researchers. The school has a diverse student population and a team of experienced teachers willing to share their views and experiences with the researchers. The school also has a supportive leadership team that values teacher professional development and is open to exploring innovative approaches to curriculum management. The case study involved multiple data collection methods, including document analysis, observation, and interviews with teachers, case school leaders, and students. The SECI knowledge creation model guides data analysis to identify effective pedagogy and curriculum designs for implementing the school's Learning to Learn 2.0+ curriculum.

3.3. Data analysis

Data analysis for this study involved a combination of deductive and inductive approaches. The deductive approach was used to analyze the data collected against the SECI model and 21st-century skills framework. The inductive approach involved identifying emerging themes

and patterns from the data. Data were analyzed using NVivo software, and triangulation of data sources was conducted to ensure the validity and reliability of the findings. The data collection and analysis methods used in this study are consistent with case study research approaches, as Yin (2018) described. Using multiple data sources and triangulation of findings are key strategies for enhancing the reliability and validity of the findings in case study research [18].

4. Results and discussion

The case school faced challenges such as student disengagement, lack of motivation, and low academic performance. The school leaders adopted Lesson Studies to address this challenge and enhance students' learning outcomes. The principal initiated the lesson study, played a crucial role as a knowledge leader, and was supported by a partnership with a university. The lesson study was led by the vice-principal, who acted as a knowledge producer, facilitator, and builder of the contextual SECI model in the school. The Lesson Study process involved a team of teachers collaborating and reflecting on their lesson plans, classroom instruction, and student learning outcomes.

4.1. Applying metacognitive teaching for enhancing student learning

As documented in the school plan, the school identified metacognitive skills as the primary focus of their teaching and learning plan. Before the start of the academic year, teachers engaged in discussions on generic teaching strategies to develop their students' metacognition. These metacognitive teaching strategies included *"thinking aloud," "self-questioning," and "teaching students the skills of self-monitoring through directed instruction"*, as documented in the school plan. The subject teachers were tasked to discuss applying these strategies to their respective subjects to deliver subject knowledge effectively to the students.

The SECI model was used to lead the school's situation and identify the need for enhancing the metacognitive competency of students. Several sub-groups were organized to discuss achieving this goal in different subjects. The school plan is documented to guide students to achieve critical thinking in evaluating issues in different subjects. The plan documented that *lesson study enables teachers to better understand metacognitive teaching skills*. The school was able to develop a metacognitive pedagogical content knowledge platform. This approach has facilitated the development of the 21st-century competencies that students need to succeed in the new era. To create and facilitate the pedagogical content knowledge, the vice principal told the researcher that "*she learned metacognitive teaching strategies from a course and invited university professors to disseminate the pedagogy in a teacher's workshop".*

4.2. Coaching as a knowledge socialization process

The vice principal acted as a knowledge facilitator and coached the teachers. The teachers worked together to develop PCK during Lesson planning meetings and discussed how to facilitate metacognitive teaching by exchanging their tacit knowledge and converting it into explicit knowledge. The language subjects focused on developing reading and writing skills, while Maths and Science subjects were more concerned with problem-solving and inquiry-based learning abilities. Science and Maths teachers used thinking aloud and self-questioning

through real-life examples to develop these skills in their students. Teachers aimed to align their teaching strategies with the school-level curriculum plan.

The researcher observed that during the coaching sessions, professional dialogues were encouraged, which helped the teachers construct their subject-teaching plans. In the coaching process, the teachers discussed the guided questions that would assist them in clarifying the expected learning outcomes of students. They attempted to select and incorporate metacognitive teaching strategies into their lesson plans. Guided questions were frequently used during these coaching sessions, such as "*What is the learning objective of the lesson*?", "*What is the purpose of using metacognitive teaching strategies*?", "*What are students' learning difficulties related to the topic?*" and "*How can we demonstrate that students have learned the material*?" Through guided questions and professional dialogue, the teachers at the school improved their understanding of metacognitive teaching and effectively incorporated it into their lesson plans. The vice principal also reminded teachers to consider learning diversity when adopting metacognitive pedagogy. The teachers' ideas were affirmed and challenged through rephrasing and contrasting questions. The coaching process is a knowledge socialization process in which they share their tacit knowledge of metacognitive teaching strategies and subject content knowledge.

Lesson observation among teachers who attempted the metacognitive pedagogy was also found to help facilitate learning of the pedagogy from peers. The researcher took field notes that the "*lesson observation and sharing experiences led to fruitful outcomes in improving teaching strategies"*. One example highlighted in the researcher field notes that Liberal Studies teacher named Teacher W, who observed video lessons conducted by a Chinese History teacher who successfully applied metacognitive teaching strategies in a debate. Teacher W then shared her experience with her colleagues, asking them about their teaching procedures. "*Through the sharing and discussion, she could identify key teaching strategies, such as think-aloud, visualization, and student-oriented discussions, along with adequate prior knowledge preparation, that could be implemented in her Liberal Studies lessons"*. Her ideas were further refined and streamlined during the coaching process. The researcher observed that sharing dialogue and lesson observation in socialization helped teachers reflect and reconstruct their teaching strategies. By learning from their peers and engaging in reflective practice, teachers were able to improve their pedagogical approaches and ultimately enhance the quality of their teaching.

4.3. Post-lesson conferencing as a knowledge externalization process

The process of externalization was conducted through lesson collaboration, lesson observation, and post-lesson sharing. During collaborative lesson planning, Teacher W turned the tacit metacognitive knowledge learned in socialization into explicit one [19] by designing lesson plans and teaching materials. This codified knowledge was modified during lesson collaboration with her colleagues teaching the same form. The curriculum documents of Liberal Studies stress "*critical thinking and thinking in multiple perspectives of students"*, and teachers must explicitly teach these thinking skills. To excel in Liberal Studies in public examination, students must be knowledgeable and skilled in answering questions. This explains why upon teaching how to judge the pros and cons of an interpretation of laws in research lessons for high school students, Ms. W prepared very detailed prior knowledge for students to do self-study.

Moreover, the teaching materials were designed with much visualized thinking guidance. The lessons were designed in a student-centered approach where the teacher acted as a

facilitator who adopted many metacognitive teaching strategies. In her design of teaching materials, the mind map, thinking framework, hint boxes, and self-evaluation were well embedded according to learning objectives to enhance students' metacognitive awareness and regulation. During lesson collaboration, Teacher W was delighted that her counterparts gave very useful suggestions - let students choose the best judging process in the concluding session. In this way, the elements of metacognitive teaching in the teaching materials were enriched.

4.4. Lesson implementation is a process of knowledge internalization

The field notes for the lesson observation documented that "*Teacher W started by asking students how to judge the effect of an interpretation of the Basic Law by SCNPC on society.*" Before answering this question, she asked students to use e-learning to express their opinion after generalizing different stakeholders' views on teaching materials. "*Students' opinions were visualized in terms of a sentence of different font sizes and colors so that students became aware of the most common thoughts among peers. She then used another similar example to think aloud to demonstrate the thinking flow. During the think-aloud process, the visualization of her thinking process was again illustrated in a different color, which other teachers of the same and different subjects highly appreciated*." They agreed that this thinking visualization could effectively provoke students' metacognitive awareness, especially students of average academic ability. During individual and group thinking (collaborative learning), students' thinking was scaffolded by the thinking frameworks and hint boxes. All students were highly engaged in this session. Teacher W articulated the discussion effectively using an excellent questioning technique and well-organized flow. Students were eager to discuss and even challenge peers in a different group. Upon asking about the criteria for judging, some students showed surprise and awareness when a student reminded them what they had learned two years ago in Chinese History debate lessons. In post-lesson sharing, teachers highly confirmed such behaviours indicated metacognitive awareness and regulation of students were provoked.

Students were asked to choose the best thinking flow for the judging issue. This part was the most splendid since students were forced to apply what they learned in the Lesson in the way that they monitored and evaluated strategies and regulated according to their views. One student explained the reason why to choose the simple one was because of considering his ability. Again, teachers in post-lesson observation praised this session very much as this provoked students to think like Plan-Implement- evaluation.

4.5. Across- subject sharing as a knowledge combination process

In post-lesson observation, there were some further suggestions to adopt metacognitive teaching. For example, to cater to learning diversity, the pace of instruction can be slowed down, and why some students did not respond well should be figured out. Teacher W reflected on the implementation of adopting the metacognitive teaching strategies and will improve in lessons later on. Her colleagues will attempt the second cycle of Lessons using improved metacognitive teaching strategies.

Whole school professional development meetings were held to synthesize the teaching strategies from each subject and create school-level explicit knowledge. It is observed that "*the teachers created a teaching guidebook to retain knowledge, codifying their findings into lesson plans, teaching materials, and artefacts".* They internalized the organization's Problem-Based Learning (PBL) knowledge by practicing PBL in their classes. The researcher

observed that the combination process was arranged by sharing lesson studies among all teachers. The school-level curriculum study triggered individual, team, and organizational reflection. The case school leaders combined the pedagogical content knowledge from different subjects to effectively implement the school-level curriculum. The school-level curriculum study enabled the school to integrate PCK from individual subjects and make curriculum management more effective. Three main findings of explicit metacognitive pedagogical knowledge were recorded, "*purposeful questioning, student-oriented inquiry approach, and catering to learning diversity"* It can be a useful framework for teachers in the case school to design effective teaching strategies that support students' metacognition and learning.

After generalizing the common practices of the subjects shared, three main findings of explicit metacognitive pedagogical knowledge were identified that can be incorporated into teaching strategies in the case school. The school report documented the following school-level pedagogies:

1. Purposeful questioning at different levels, including self-questioning and dialogue, can improve metacognition and learning outcomes among students.
2. Adopting a student-oriented inquiry approach can enhance students' metacognitive skills and improve learning outcomes.
3. Regulating the extent of visualization, instruction pace, and the role of students can help cater to learning diversity among students.

4.6. Lesson implementation as a knowledge internalization process

The response from the teachers and the initiative taken by the case school demonstrate a willingness to incorporate metacognitive teaching strategies, which we believe will lead to improved student learning outcomes. After conducting the first Lesson Study circle on teachers in different subject disciplines, the researcher observed that *all teachers responded positively regarding the feasibility and implementation of metacognitive teaching strategies in their future lessons.* The school showed great interest in this approach and arranged for all subjects to conduct lesson studies and available lessons on metacognitive teaching. Various metacognitive teaching strategies, including error detection, think-aloud, visualization, questioning, and self-questioning, were discussed if they will be adopted in school L. Building on the common practices of the subjects shared in combination, the vice principal reframed the explicit metacognitive pedagogical knowledge and focused on '*How questioning and feedback provoke student's metacognitive awareness, monitoring and regulation*'. She discussed with some subjects to launch their second cycle of Lesson Study.

5. Conclusion

The primary objective of the study is to assess the effectiveness of using the SECI knowledge creation model as a guiding curriculum framework to facilitate the Lesson Study process and to improve student engagement and motivation. The process allowed teachers to collaborate and reflect on their teaching practices, which led to the development of effective lessons that addressed the needs of their students. The vetting process also ensured that the lessons were aligned with the 21st-century curriculum and met the highest standards of academic rigor. This case study proves that Lesson Study is an effective professional development approach that can improve school teaching and learning. It presents an

innovative approach to institutionalizing a curriculum management mechanism in schools by utilizing the SECI model as a guiding framework to create pedagogical content knowledge for curriculum implementation.

The SECI model can be applied to help schools synchronize the operation of the school-level curriculum with managing the subject-level curriculum to bridge the knowledge gap for curriculum implementation. The model explains how individual tacit knowledge can be combined into subject-department level and school-level knowledge. The SECI model provides a very practical framework for schools in Hong Kong to manage the school curriculum in the new era of Learning to Learn 2.0+. The study's findings have significant implications for school education in Hong Kong, as they provide an effective curriculum management mechanism to facilitate the implementation of the Learning to Learn 2.0 curriculum. The study has produced several noteworthy outcomes. Firstly, it has proposed a curriculum management model that enables schools to deliver higher-quality education. Secondly, it has confirmed the effectiveness of management practices and relevant support conditions required to operate the SECI model in a challenging educational environment. Finally, the study has constructed an empirical curriculum model that could help policymakers improve quality assurance in education by reconceptualising the existing key performance measures of the framework.

To institutionalize the SECI knowledge management model for curriculum management, school leaders could provide school-based training and support to teachers on implementing the SECI model in their curriculum planning and delivery. They should also create a culture of knowledge-sharing and collaboration among teachers and encourage them to share their ideas and experiences. They should monitor and evaluate the effectiveness of the SECI model in improving curriculum quality and student outcomes and use this information to make continuous improvements. By doing these, school leaders can help to institutionalize the SECI model for curriculum management, improving the quality of education and enhancing student learning outcomes.

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