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Bridging pedagogy and practice: Hybrid collaborative learning based lesson study integrated with wahdatul ulum principles for pre-service biology teacher

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ABSTRACT

In an era that requires a balance between theory and practice for effective teaching, pre-service teachers need the skills to design integrated, contextual, and meaningful learning experiences. This study examines the impact of implementing a Hybrid Collaborative Learning-based Lesson Study, oriented toward Wahdatul Ulum, on the lesson planning skills of pre-service biology teachers. The study employs a mixed-method approach with a parallel convergent design. Quantitative data were collected through questionnaires administered to 83 students at the end of the Biology Lesson Planning course at a State Islamic University in North Sumatra, while qualitative data were obtained through semi-structured interviews. The instruments used included Likert scale questionnaires and interview sheets. Data was analyzed using descriptive statistics and thematic content analysis. The result analysis indicate that the skills developed include formulating learning indicators and objectives, preparing materials, and designing learning steps in accordance with instructional syntax. Teaching practice also aided students in identifying challenges and learning from peer teaching. These findings suggest that an approach integrating theory, practice, and religious values is effective for developing the pedagogical skills, character, and professionalism of pre-service biology teachers.

Keywords: Hybrid collaborative learning, lesson study, lesson planning, wahdatul ulum

INTRODUCTION

Teaching is a complex activity that requires the involvement of cognitive processes, especially in the aspect of lesson planning. Mutton et al. (2011) contend that acquiring the skills to design lesson plans and comprehending the significance of these plans are essential skills that novice teachers must develop. Planning lessons stands at the core of the daily responsibilities for every teacher (Farhang et al., 2023; Karlström & Hamza, 2021; Richards & Farrell, 2011), and for aspiring teacher students, it serves as a method to guarantee successful classroom performance (Rusznyak & Walton, 2011). Ruys, Keer & Aelterman (2012) elaborate that the process of lesson planning is deemed essential for enhancing the professional competence of teachers. This suggests that proficient educators should be adept in the art of lesson planning.

Nevertheless, certain research findings indicate that both educators and aspiring teachers lack expertise and encounter challenges in lesson planning. Teachers still grapple with a lack of comprehension in constructing lesson plans aligned with the current curriculum (Nunung, 2021). Additionally, educators commonly find it challenging to apply the principles of developing lesson plans according to the requirements of the 2013 Curriculum (Susena et al., 2016). This includes tasks such as formulating indicators, selecting teaching approaches and models, designing learning activities, as well as defining assessment criteria and instruments (Ernawati & Safitri, 2017; Rohayati et al., 2018).

Similar results were identified in pre-service teacher students, as outlined by Jayanti (2020). This suggests that these students are still

lacking in skills to determine learning activities and adjust suitable teaching models to match the material's characteristics and the demands of curriculum's Basic Competencies. Therefore, significant efforts are needed from various parties, particularly teacher education programs, to impart training and enhance the planning skills of future educators.

Teacher preparation programs play a vital role in fostering the lesson planning skills of pre-service teachers (Chen & Zhang, 2019). Additionally, Konig et al. (2020) stated that these programs provide opportunities to enhance the knowledge and skills of pre-service teachers in lesson planning. However, Karlstorm & Hamza (2021) elaborate that, typically, lesson planning is instructed through the introduction of theory-based planning models. Nevertheless, these models constrain viewpoints on teaching and methodologies in learning and instruction.

To reinforce this argument, it is crucial to emphasize that collaborative lesson planning offers a more dynamic and reflective alternative to traditional, theory-driven approaches (Gutierez, 2021; McDuff, 2012). Drawing on sociocultural theory (Vygotsky & Cole, 1978), John (2006) introduces the concept of dialogical lesson planning through Lesson Study, highlighting that planning itself is a practical and interactive process. Moreover, this approach supports the concept of a teacher study team, where educators engage in discussions to examine specific teaching materials, participate in teaching exercises, and observe others' teaching (Mostofo, 2014). The primary goal is to deepen their comprehension of student learning (John, 2006) and enhance the efficacy achieved through collaborative learning among pre-service teachers (Chen & Zhang, 2019).

Collaborative learning promotes constructive discussions, enhance interaction and encourages arguments and dialogues among pre-service teacher students (Irzawati, 2023). This process enables them to reflect on their teaching methods, deepen their understanding of learning, build new knowledge, and develop communication skills. As per Jia (2005) and Strijbos & Fisher (2007), collaborative learning comes in two forms: class-based and web-based. Ravindra (2015) further suggests that the most effective outcomes emerge when class-based and web-based collaborative learning are combined (hybrid collaborative learning).

In both theory and practice, lesson study and hybrid collaborative learning introduce a novel viewpoint for elevating the quality of initial teacher education. However, few have employed lesson study and hybrid collaborative learning in the lesson planning course, either separately or by integrating both. Chen & Zhang (2019) have implemented a process to enhance knowledge and planning skills in the lesson planning course for pre-service mathematics teacher students through the utilization of lesson study. However, they have not implemented it on hybrid collaborative learning setting. In the meantime, Golightly & Westhuizen (2016) have employed a hybrid collaborative learning approach in the microteaching course for pre-service geography teacher students.

The findings from both studies suggest noteworthy outcomes concerning the enhancement of the lesson planning skills of pre-service teacher students. This opens opportunities for research in various contexts and subjects, including the integration of lesson study in a hybrid collaborative learning setting for pre-service biology teacher students. It offers the potential to examine the adaptability of lesson study in addressing diverse educational challenges and fostering innovative teaching methodologies in biology education.

Department of Biology Education Program at UIN Sumatera Utara is one of the biology education programs in Indonesia that employs lesson study and integrated it on hybrid collaborative learning setting for Biology Lesson Planning course. This innovative approach reflects the Department's commitment to integrating faith-based values with modern pedagogical practices, fostering a holistic understanding of science and education. By embedding collaborative learning features that emphasize conceptual understanding and

interdisciplinary connections, the program not only strengthens pre-service teachers' pedagogical skills but also aligns seamlessly with the Wahdatul Ulum paradigm.

Wahdatul Ulum is a vision, concept, and scholarly paradigm that embodies the unity of knowledge, rooted in the belief that all knowledge originates from divine revelation (Harahap et al., 2019). As affirmed by Siregar et al. (2019), the Wahdatul Ulum paradigm serves as the foundational framework for integrating diverse fields of knowledge. This paradigm integrates Islamic scientific approaches with specific Islamic sciences, while also bridging various fields such as Islamic sciences, natural sciences, social sciences, and the humanities. This distinctive framework integrates Islamic teachings from the Qur'an and Hadith (kauliyah verses) with the natural sciences phenomena (kauniyah verses), ensuring that graduates possess both scholarly expertise and a profound understanding of the harmonious relationship between faith and knowledge.

The Wahdatul Ulum paradigm plays a crucial role in shaping both lesson planning and the collaborative lesson study approach. It encourages pre-service teachers to design learning experiences that address both the spiritual and intellectual dimensions of education. In the context of biology, lesson planning is inherently tied to the subject's content, which includes theories, concepts, and laws related to the natural world. Within the Wahdatul Ulum framework, nature is seen as a medium of divine revelation through kauniyah verses, which can be explored to enhance knowledge (Harahap et al., 2019). As such, it is vital for both teachers and pre-service teachers to incorporate these kauniyah verses into biology lesson planning, fostering a deeper understanding of the interconnectedness between science and spirituality.

Collaborative lesson study provides a practical approach where educators share knowledge and insights, deepening their understanding of both content and pedagogy. This aligns with the principles of Wahdatul Ulum, promoting cooperation, interdisciplinary learning (Harahap et al., 2019), and the holistic development of students. It ensures that teaching practices are rooted in academic rigor and ethical responsibility. Through this approach, pre-service teachers enhance their lesson planning skills while developing a broader perspective that bridges religious and scientific knowledge.

However, the study by Jayanti (2022) primarily examines the implementation phase of Lesson Study incorporating Hybrid Collaborative Learning with a Wahdatul Ulum orientation in the Biology Lesson Planning course, and its effect on students' learning outcomes, as assessed through midterm and final exam results. The impact of integrating Lesson Study with hybrid collaborative learning in the Biology Lesson Planning course, particularly in terms of designing learning experiences for pre-service biology teachers, remains unexplored.

Based on the context provided, this study examines the implications of each stage of Lesson Study incorporating Hybrid Collaborative Learning with a Wahdatul Ulum orientation on pre-service teacher's ability to effectively plan biology lessons. This research is expected to present empirical evidence regarding its impact on the competence of designing learning experiences for pre-service teachers and can be implemented in diverse contexts beyond the training of biology teacher candidates.

METHOD

In this study, mixed-method research is employed, integrating the collection and analysis of both quantitative and qualitative data within a unified framework, using a convergent parallel design (Cresswell, 2012; Leedy & Ormrod, 2015).

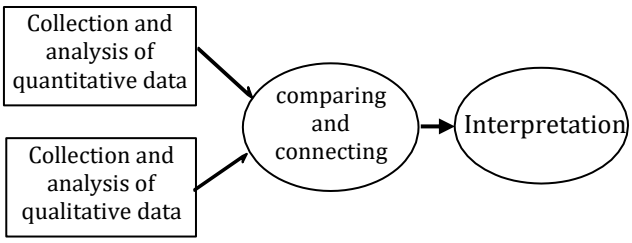

Figure 1. Visual model of the parallel convergent design procedure (Cresswell, 2012)

The convergent parallel design enables the researcher to gather and analyze quantitative and qualitative data separately, compare the findings from both analyses, and subsequently interpret whether the results are conflicting or complementary. Figure 1 illustrates the visualization of the stages in mixed-method research with a convergent parallel design.

The technique for determining respondents for quantitative data collection is conducted using the total sampling technique (Sugiyono, 2014). Total sampling is a sampling technique where the number of samples is equal to the population. In this study, the population and sample consist of 83 students taking the Biology Learning Planning course.

In the qualitative data collection process, respondents are chosen using purposive sampling. For this study, participants are selected based on specific criteria, including those serving as model teachers and observers in the Lesson Study group, along with individuals capable of offering varied opinions and perspectives on the examined research problem.

The implementation of the Lesson Study cycle based on hybrid collaborative learning oriented towards Wahdatul Ulum is carried out by adapting the Lesson Study cycle developed by Chen & Zhang (2019) and Jayanti (2022), which includes the stages of *Learn, Plan*, *Implement*, *See*, and *Reflect*. The *Learn* stage focuses on exploring theories related to lesson planning and the Wahdatul Ulum paradigm. In this stage, students examine key concepts such as: 1) lesson planning and its connection to Wahdatul Ulum; 2) academic calendar formulation and effective teaching hours; 3) competency indicators and learning objectives; 4) syllabus and lesson plan development; and 5) assessment. Students work collaboratively on worksheets, which serve as a foundation for their knowledge as future educators (Chen & Zhang, 2019).

The *Learn* stage lasts five weeks, delivered through synchronous classroom-based collaborative learning. Afterward, a midterm test assesses students' individual lesson planning abilities.

In the *Plan* stage, students apply the theoretical knowledge from the Learn stage to collaboratively plan lessons. This stage involves both asynchronous and synchronous activities, with students divided into Lesson Study (LS) groups of three. One student act as the model teacher, while the others observe. Each group creates lesson plans and uploads them to Google Classroom for review. The instructor provides feedback and example materials to help improve the quality of the lesson plans, as suggested by Ganesh & Matteson (2010).

The *Implement* stage involves classroom-based collaborative learning, where the model teacher conducts a micro-teaching session, recorded for review. This allows pre-service teachers to develop lesson delivery and reflective skills (Frick et al., 2010). The teaching session is reviewed asynchronously by other students through a Moodle-based LMS discussion forum.

Finally, the *Reflect* stage occurs both asynchronously and synchronously. Synchronous reflection involves the instructor discussing the lesson's implementation, offering suggestions for the model teacher, and highlighting key lessons learned. Asynchronous reflection is done by observers and pseudo-students, focusing on the teaching methods and insights gained during the session.

Quantitative data collection is done using a questionnaire, while qualitative data is collected through semi-structured interviews and documentation of lecture artifacts. Quantitative data analysis involves a quantitative descriptive analysis approach to describe the trends in student responses to statements in the questionnaire. The results are then converted into percentage form.

Qualitative data analysis aims to summarize and interpret research conditions through selection, inductive categorization, and comparison, following the general inductive approach (Thomas, 2006). The stages of data analysis, following Hervas et al. (2020), are as follows: (1) transcribing interviews, (2) analyzing

the observer reflection notes, and (3) thematically coding all collected data into categories and subcategories. To ensure data confidentiality, each participant's excerpt is coded as "P".

RESULTS AND DISCUSSION

Implications of the *Learn* phase in developing students' lesson planning skills

The *Learn* phase serves as the foundational step in implementing the Lesson Study based on Hybrid Collaborative Learning oriented towards Wahdatul Ulum in the Biology Lesson Planning course. During this phase, students receive theoretical instruction on lesson planning in general, with a particular emphasis on planning for biology lessons. The analysis of the interview findings suggests that the *Learn* phase facilitates the development of students' proficiency in lesson planning, focusing on 1) formulating learning indicators and objectives, 2) selecting educational materials and media, and 3) identifying, selecting, and organizing teaching resources.

Several participants were able to explain how to formulate learning steps and determine assessment criteria and formats. The implementation of the *Learn* stage was conducted through classroom-based collaborative learning. However, some students still encounter difficulties during the Learn stage, particularly in formulating learning indicators and objectives when working in groups. This challenge arises because, at this stage, students are required to explore the tasks in the Student Worksheet (*LKM*) collaboratively. A key factor that enhances students' understanding of the theory related to formulating learning indicators and objectives is the lecturer's confirmation at the end of each class discussion.

This indicates that, in general, students are still unfamiliar with the concept of lesson planning. The lesson planning concept they are learning remains abstract, as many students initially believe that a teacher's responsibility is limited to delivering material in front of the class without preparing what will be taught to the students. In reality, lesson planning is a critical part of a teacher's duties. Therefore, as pre-service teachers who are still inexperienced with the intricacies of lesson planning, students need intensive guidance from supervisors or lecturers who are more knowledgeable in this area.

Furthermore, feedback from lecturers and peers has proven to assist students in planning and executing tasks more effectively (Golightly & Westhuizen, 2016) throughout the five-week Implementation phase. This is supported by survey results, which show that 47.73% of participants strongly agree (SA), and 43.18% agree (AG) that lecturer confirmation during the Learn phase helped improve their understanding of biology lesson planning, as illustrated in Figure 2.

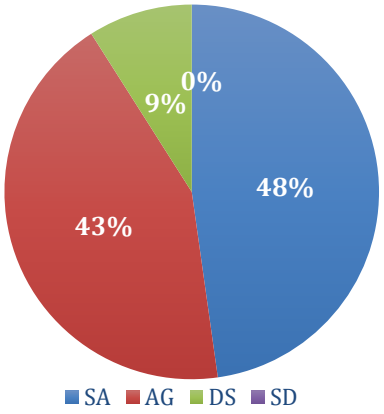

Figure 2. Participant response percentages on the impact of lecturer feedback in improving course material comprehension. SA= Strongly Agree; AG= Agreed; DS= Disagree and SD= Strongly Disagree

Nevertheless, a small number of participants perceived the implementation of Lesson Study based on Hybrid Collaborative Learning in the Biology Lesson Planning course as less efficient. Students still faced difficulties in completing the Student Worksheet (*LKM*) in groups, with 2.27% of participants responding that they did not understand, and 27.27% agreeing that they had not yet grasped the concept of lesson planning. Based on interview

analysis, it was found that the challenges in understanding the lesson planning concept during the Plan stage stemmed from the perception that the instructions in the LKM were convoluted, and the requirement for independent learning made completing the LKM more difficult. This is reflected in the interview excerpts from P1 and P2 below.

> "*The challenge for me lies in my lack of understanding, particularly with the annual and semester program materials... The LKM is somewhat convoluted to work on*." (P1, September 16, 2022)

> "*... Since we are required to first comprehend the theory or task provided, it is somewhat difficult to understand the tasks in the LKM*." (P2, September 16, 2022)

The solution students implemented to overcome the challenges they encountered was to engage in literature review and discuss with peers who had a better understanding. This is reflected in the responses of P1 and P3 below.

> "*I frequently searched for other sources and tried to solve them on my own*." (P1 September 16, 2022)

> "*I asked friends who understood the material*." (P3, September 16, 2022)

The implications of the *Plan* stage in developing students' lesson planning skills

The *Plan* stage is conducted after exploring the concept of biology lesson planning during the *Learn* phase. In this stage, students directly practice the process of lesson planning in accordance with the theories they have previously studied. Students are divided into Lesson Study (LS) groups, each consisting of three members. Each LS group collaborates to develop a lesson plan that includes Chapter Design, Lesson Design, and Student Worksheets (*LKPD*).

Based on the results of the interview analysis conducted, the *Plan* stage aids students in enhancing their lesson planning skills, particularly in the following areas: 1) formulating learning indicators and objectives; 2) developing learning steps; 3) selecting learning resources and media; 4) identifying, choosing, and organizing teaching materials; 5) determining assessment criteria and formats; and 6) understanding and relating relevant verses of nature to biological concepts.

Furthermore, the implementation of the *Plan* stage, which follows the *Learn* stage, contributes to students' ability to connect theory and practice as well. This is reflected in the survey analysis results, which show that over 50% of respondents agree (AG) with several statements provided, as indicated in Figure 3.

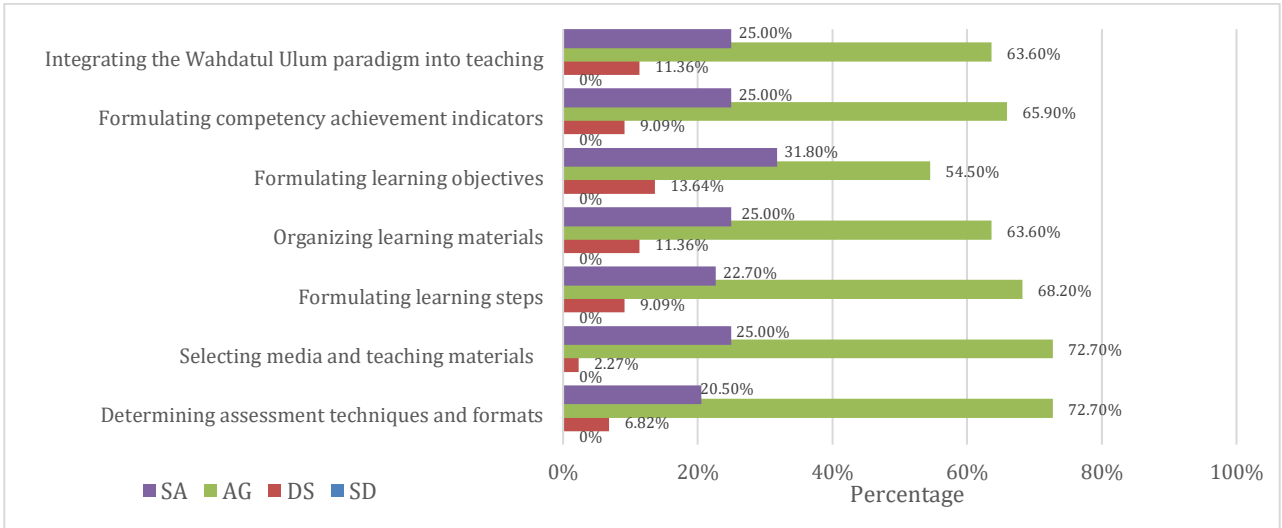

Figure 3. Percentage of participant responses regarding the collaborative contribution of the *Plan* stage in understanding the concept of Biology Lesson Planning.

However, participants experienced challenges during the *Plan* stage. P4, in her interview response, explained, "*I am not yet fully confident in selecting the appropriate learning model for the chosen material and integrating the syntax of the selected learning model into the Student Worksheet*."

This indicates that students still struggle to comprehend the syntax of learning models. P5 and P2's interview response confirms that the difficulty students face in understanding the syntax of learning models arises from differences in understanding the syntax studied in the Biology Lesson Planning course compared to what was learned in the Biology Learning Strategies course. This is illustrated in the following interview excerpt.

> "*I am not yet very familiar with the learning models, Ma'am. Moreover, the syntax we studied in the Biology Learning Strategies course is from different sources than the book you are using*." (P2, September 16, 2022)

The implications of the *Implement* stage in developing students' lesson planning skills

During the Implement stage, each LS group practices the lesson plan formulated in the *Plan* stage. At this stage, the model teacher from each LS group instructs the class according to the material outlined in the Chapter Design and Lesson Design. The model teaching occurs in a classroom setting for 45 minutes. Meanwhile, the other two members of the LS group act as observers of the model teacher's instruction. The Implement stage spans five weeks.

Based on the analysis of the questionnaire, the implementation phase assists students in understanding: 1) the execution of initial learning activities; 2) the execution of core learning activities; 3) the implementation of various instructional model syntax; 4) the integration of the Wahdatul Ulum paradigm in biology education; and 5) the execution of closing learning activities. A summary of the questionnaire analysis results can be seen in Figure 4.

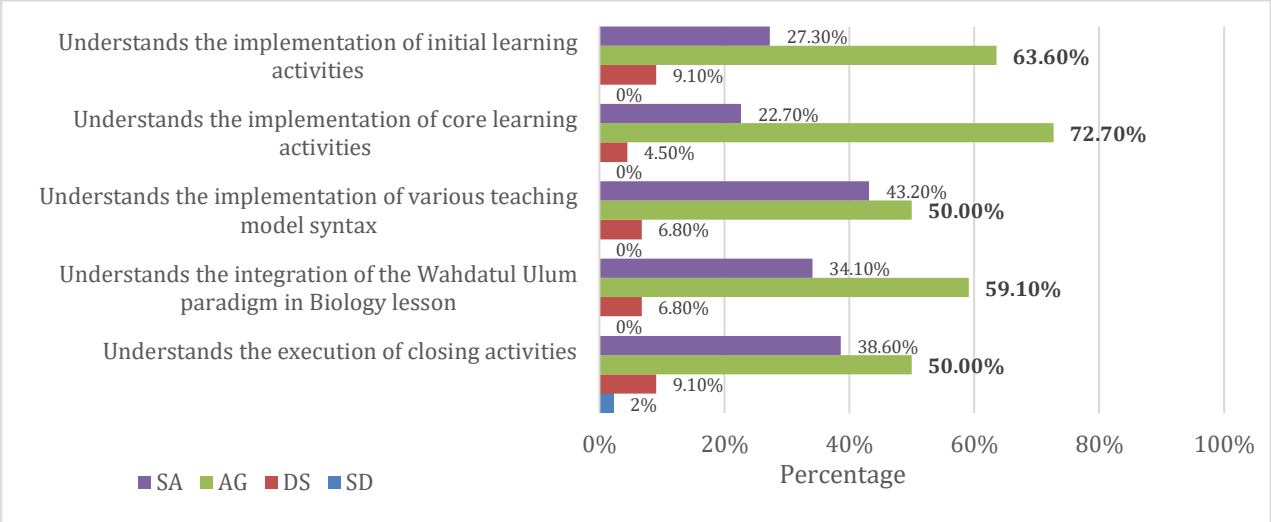

Figure 4. Percentage of participants responds regarding the contribution of the *Implementation* phase to their understanding of Biology Learning Planning concepts and its execution in classical classroom settings.

Based on the interview data analysis, the implementation phase influences students' ability to plan lessons. P4 highlighted the importance of teachers being thorough when designing the apperception stage in the learning process. This stage is crucial in developing lesson plans, as it is reflected in the initial learning activities. The teaching practices based on the previously developed lesson plans during the Plan phase made P4 realize that teachers must engage students early in the learning process and think from the students' perspective when

designing lesson plans. P1 added that through the Implementation phase, students learn to master the selected material and implement the syntax of instructional models. Other valuable outcomes from the Implementation phase include: 1) providing insights into the teaching profession; 2) facilitating the development of students' reflective abilities; and 3) offering hands-on classroom learning experiences.

Nevertheless, students still encounter challenges when practicing their lesson plans during the Implementation phase. These challenges included: 1) difficulties in delivering content (explanatory skills); 2) discrepancies between the time allocation and the lesson plan; and 3) issues related to the use of instructional media. P6 expressed the difficulty in delivering content, stating, "I was nervous when presenting the material in front of the class." Meanwhile, the time allocation discrepancies were reported by P4 and P3.

Furthermore, P7 and P1 added that the challenge they encountered was related to the presentation of instructional media, specifically videos. P7 explained, *"...during the video presentation, the speaker volume was too low*." P1 further noted, *"...the video was played without using external speakers, so the sound was not clearly audible to the students*."

The challenges experienced did not hinder the students from carrying out their teaching practice. P4 and P3 explained that to address the issue of time allocation discrepancies, they used tools like wristwatches and made every effort to adhere to the planned time allocation. Meanwhile, P1 and P7 added that they shared the video link with the class group, allowing students to access the video's audio more effectively.

The implications of the *See* and *Reflect* phases in developing students' lesson planning skills

The teaching practices conducted during the *Implementation* phase are recorded and subsequently uploaded to the university's e-learning platform for observation and feedback from students who did not engage in the teaching practice (*See* phase). Additionally, reflections from the model teacher and observers are uploaded to the e-learning discussion forum as part of the Reflect phase. Each student reviews these comments and reflections to evaluate the teaching practices carried out by the LS group.

In the *See* phase, participants gain a deep understanding of the implementation of instructional model syntax and the use of instructional media. This is reflected in the responses from P3 and P5as follows.

> "*I had not previously understood the implementation of several instructional model syntaxes. Now, through the See phase, I have gained that understanding*." (P3, September 16, 2022)

> "*If possible, the instructional models in the classroom should be varied to prevent student boredom. Additionally, I need to further develop the instructional media*." (P5, September 16, 2022)

Furthermore, the See phase provides examples of best practices from peers in lesson planning that can be modeled and adapted by other students. This is illustrated in P1's response below.

> "*...observing the positive aspects from peers and intending to incorporate them into my future biology lesson planning*." (P1, September 16, 2022)

Subsequently, through the Reflect phase, participants recognized aspects that needed improvement in their lesson planning and teaching processes. P5, P6 and P7 emphasized the importance of understanding the connection between instructional model syntax and the content being taught, as well as its application in the teaching process. Meanwhile, P4 and P3 acknowledged the significance of classroom management and the teacher's role as a facilitator, as implied in the following interview excerpts.

> "*The process of forming study groups should ideally be determined by the teacher based on the heterogeneity of the class*." (P3, September 16, 2022)

The participants' reflection results in their interview responses are corroborated by the analysis of the model teacher's reflections, which were uploaded to the web-based discussion forum using e-learning. Several categories of challenges can be seen in Table 1.

Table 1. Model teacher reflections in the see and reflect phases

Category	Excerpts of Model Teacher Reflections
Understanding student characteristics	*"...teachers should be able to recognize students who have interests and talents aligned with their skills."*
Understanding learning model syntax	*"...have a thorough understanding of the instructional model syntax being employed."*
Material comprehension	*"Providing the necessary materials or media in accordance with the learning content."*
	"Teachers must have a strong grasp of the material to ensure a smooth learning process."
Classroom management	*"Must be able to manage the classroom effectively to facilitate the learning process."*
Learning facilitator	*"The teacher actively monitors student activities."*

Additionally, participants gained valuable insights (lessons learned) from their teaching practice that can support the development of their lesson planning skills in the future. A summary of the valuable lessons learned by the model teacher is presented in Table 2.

Table 2. Valuable lessons learned by the model teacher in the see and reflect phases

Category	Excerpts of Model Teacher Reflections
Overview of the Teacher's duties	*"... the overview of being teacher is not easy"*
	"Becoming a teacher is not an easy task, as we are faced with students of diverse characteristics. It is essential to create a learning environment that is engaging for students and to deliver the material effectively so that it can be easily understood by the learners."
	"The emergence of both excitement and apprehension arises from the need to master the subject matter beyond the students' understanding and the responsibility to create a conducive classroom environment. From this experience, I have learned that being a teacher is not an easy task."
	"...it turns out that encouraging students to actively engage in discussions is quite challenging."
Under-standing learning model syntax	*"There is a need for a thorough understanding of the syntax of the model used by the teacher before it is implemented in the classroom."*
Learning oriented to student needs	*"Regardless of the curriculum and teaching strategies employed, teachers must pay equal attention to all students in the classroom. When teachers do so, students will become more motivated and shift their behavior from being passive to active learners."*
	"... teachers need to develop strategies that encourage quiet students to express their opinions."
Teaching experience	*"...through Lesson Study, I gained valuable experience in classroom teaching techniques and effective methods of delivering instruction."*
Understanding student characteristics	*"The valuable lesson I acquired is the ability to observe various student characteristics."*
Reflective ability	*"...utilizing the shortcomings of learning activities as a basis for evaluative improvement."*
Time management	*"...we must strive to make that time more valuable, as effective time management allows the entire learning process to proceed according to the established syntax."*
Variations in teaching models	*"...it turns out that teaching methods extend beyond lectures; there are many other enjoyable approaches available."*
	"...experiencing learning through the project-based learning model is enjoyable and introduces a novel approach."
The importance of collaboration	*"The lesson I gained emphasizes the necessity of collaboration and the importance of showcasing one's best efforts."*

Reflection is not only conducted by the model teacher but also by observers, students acting as simulated learners, and the supervising lecturers. Feedback provided by lecturers, observers, and simulated students raises participants' awareness of the importance of 1) classroom management; 2) understanding the syntax of the teaching model; 3) planning time allocation; 4) comprehending the subject matter; and 5) grasping the formulation of apperception and contextual approaches. This is illustrated in the following quotes from P1, P3, P4, P5 and P7.

> "*The observer provided feedback regarding the need to improve classroom management to maintain a conducive learning environment until the end of the session. Therefore, in the future, I will plan for teachers to not only be responsible for making learning enjoyable but also to adopt a firm stance so that students respect the teacher*." (P1, September 16, 2022)

> "*I need to be more relaxed in my teaching, as the syntax is engaging, and I should incorporate ice-breaking activities*." (P3, September 16, 2022)

> "*Time allocation must be emphasized more clearly when designing learning activities*." (P4, September 16, 2022)

> "*When planning my future lessons, I need to adopt an approach that makes students feel comfortable. This can be achieved by connecting the material to everyday life*." (P5, September 16, 2022)

> "*We must have a stronger grasp of the material, and we also need to manage the classroom effectively to create a more orderly environment by seeking and adopting innovative approaches in our teaching*." (P6, September 16, 2022)

The reflections expressed by participants in their interview responses were confirmed by the analysis of the observers' reflections, which were posted in the web-based discussion forum using e-learning. Several categories of observers' reflections on the teaching process conducted by the model teacher can be found in Table 3.

Table 3. Observers' reflections on the model teacher's teaching process

Category	Excerpts of Observer's Reflections
Class-room management	*"Throughout the duration of the discussion, it is expected that the model teacher periodically observes one group in relation to another and monitors their activities during the discussion."*
	"The teacher should be able to create an enjoyable atmosphere to prevent students from becoming bored."
Learning Facilitator	*"The teacher guides students by clarifying the purpose and content of the Student Activity Sheet (LKPD)."*
	"The teacher briefly explains how to complete the Student Activity Sheet (LKPD) to the students and clarifies its purpose and objectives to ensure their understanding"
Preparation before teaching	*"The teacher should prepare and practice before teaching to ensure that the material is delivered effectively."*
Implementation of evaluation	*The teacher should be aware of which students have understood the learning material, and which have not.*
Time management	*"(The teacher) should be able to maximize time to evaluate each student individually, enabling the teacher to identify who has understood the material and who has not."*
	"Instruction should adhere to the designated time frame to ensure that the learning process is concise and clear, allowing students to comprehend the material effectively."
Material comprehen-sion	*"The teacher should have a strong mastery of the learning material."*
The use of student-centered active learning	*"The PBL model, with its syntax, fosters active learning as it frequently involves students in the educational process."*
	"By employing the cooperative learning model known as jigsaw, students can collaborate and engage in discussions among groups, requiring them to take a more active role in the learning process."

The observer also highlighted valuable insights gained from the learning process facilitated by the model teacher. A summary of the lessons learned by the observer can be found in Table 4.

Table 4. Lesson learned gained by the observer from the model teacher's instructional process

Category	Excerpts of Observers' Reflections
An overview of becoming a teacher	*"I can perceive the experience of becoming a teacher from two perspectives: the challenges of managing students and preparing oneself, and the rewarding aspects of teaching."*
Student's characteristics comprehension	*"Identifying various student characteristics during the learning process and determining how to respond to them."*
Understanding variations in teaching models	*"I have come to understand that teaching models vary."*
	"Learning about new teaching models and their application in the classroom."
Class manage-ment	*"Effectively understanding classroom management."*
	"Learning how to manage the classroom and actively engage students during the learning process."
An overview of student interactions in the classroom	*"I can perceive the experience of becoming a teacher from two perspectives: the challenges of managing students and preparing oneself, and the rewarding aspects of teaching."*
Student's characteris-tics comprehension	*"I can grasp the ways in which students engage actively during the learning process."*
Material comprehension	*"The teacher should be able to comprehend and master the learning material to effectively guide students in the classroom."*
Preparation before teaching	*"The teacher should engage in preparation and practice before teaching to ensure that the material is effectively conveyed."*

Thus, the Hybrid Collaborative Learning-based Lesson Study, oriented towards Wahdatul Ulum, can promote the effectiveness of professional learning for pre-service teachers in relation to cognitive understanding of the concepts and theories of biology lesson planning. It also facilitates the development of students' lesson planning skills, like the findings reported by Chen & Zhang (2019), Chassels & Melville (2010), and Ganesh & Matteson (2010).

The **Learn phase** of the Hybrid Collaborative Learning model, applied in the Biology Lesson Planning course, plays a critical role in developing students' lesson planning skills. As the foundational stage, it equips students with the theoretical knowledge (Chen & Zhang, 2019) necessary for creating effective biology lesson plans. Through collaborative learning activities, students engage (Golightly & Westhuizen, 2016; Okolie et al., 2022) in formulating learning indicators, selecting educational materials, and identifying appropriate teaching resources.

However, some challenges arise, particularly in group work where students struggle with formulating clear learning objectives and indicators. This issue is mitigated by the lecturer's timely feedback, which enhances students' understanding and clarifies the concepts of lesson planning. Despite initial difficulties, the *Learn* phase significantly contributes to bridging the gap between abstract concepts and practical teaching tasks, allowing students to gain a deeper understanding of their future responsibilities as teachers (Chen & Zhang, 2019).

The **Plan phase** builds upon the foundation laid in the Learn phase, offering students the opportunity to directly apply theoretical knowledge through practical lesson planning exercises (Chen & Zhang, 2019). During this stage, students collaborate in Lesson Study groups to develop detailed lesson plans, which include the design of the curriculum and lesson structure, as well as the creation of Student Worksheets (LKPD). The analysis of interview

data suggests that the Plan phase further enhances students' skills in crafting lesson plans, especially in areas such as developing learning indicators, structuring learning activities, selecting resources, and formulating appropriate assessment criteria.

Moreover, this phase strengthens the connection between theory and practice (Widjaja et al., 2017; Zaragoza et al., 2023), as evidenced by survey responses where more than half of the participants expressed agreement with statements about the phase's positive impact on their understanding of lesson planning. Despite these gains, some students continued to face challenges, particularly with the syntax of learning models. Several participants expressed difficulty in selecting and integrating the appropriate learning models for their lesson plans, particularly when the model's syntax differed from what they had previously encountered in other courses, such as Biology Learning Strategies. These challenges highlighted the need for further clarity and understanding of different teaching models, underscoring the complexity of lesson planning for pre-service teachers.

The **Implement phase** serves as the practical application of the lesson plans developed during the Plan phase, with each Lesson Study group conducting actual teaching sessions based on their respective plans. This phase is crucial for refining students' instructional skills and enhancing their understanding of effective lesson delivery. Through direct classroom experience, students gain insights into the execution of learning activities, the application of various instructional models, and the integration of relevant educational paradigms, such as Wahdatul Ulum in biology education. As noted by Lewis et al. (2019), lesson study influences professional learning norms by incorporating pedagogies of practice, which are particularly evident during the Implement phase.

Interview responses reveal that the Implement phase was instrumental in deepening students' understanding of the teaching profession and fostering their reflective abilities. However, challenges in delivering content, managing time, and utilizing instructional media were reported. Issues such as nervousness when presenting and difficulties in ensuring effective use of instructional materials, such as videos, were common. This challenge is commonly encountered in the implementation of lesson study for pre-service teachers, as reported by Bjulan & Mosvold (2015) and Damayanti (2019).

Nevertheless, students employed strategies to overcome these obstacles, such as adjusting time management techniques and sharing resources to improve student engagement. Despite these challenges, the Implement phase provided students with valuable hands-on experience, contributing to their overall development as future educators.

The **See and Reflect** phases play a significant role in enhancing students' lesson planning skills by providing valuable opportunities for observation and critical reflection (Chen & Zhang, 2019; Jayanti, 2022). During the See phase, students observe the teaching practices of their peers, gaining insights into the implementation of instructional model syntax and the use of instructional media.

This phase allows students to identify the best practices in lesson planning, which they can adapt for their own future teaching. For instance, students like P3 and P5 noted a deeper understanding of instructional models and the need for variety in teaching approaches to prevent student disengagement.

Additionally, the See phase fosters a collaborative learning environment where students can reflect on the strengths of their peers' lesson plans and incorporate these insights into their own practices, as exemplified by P1's reflection on observing positive aspects of peer teaching. The feedback gathered during this phase serves as a foundation for further development of students' lesson planning abilities, reinforcing their understanding of how to structure and execute effective lessons.

The Reflect phase, on the other hand, focuses on personal and collaborative reflection, where students evaluate their teaching experiences and identify areas for improvement. Reflections from both students and the model teacher emphasize the importance of understanding the relationship between instructional model syntax and content, as well as the teacher's role in facilitating the learning process.

Students, such as P5 and P6, highlighted the need for improved classroom management and effective time allocation, while P3 noted the significance of fostering a comfortable learning environment. These reflections, supported by feedback from observers and supervising lecturers, underscore key areas for growth, including classroom management, subject matter comprehension, and the adaptation of teaching strategies to meet student needs. The collective insights gained through the See and Reflect phases provide students with essential tools for refining their lesson planning skills, enabling them to become more effective educators capable of designing engaging and well-structured learning experiences (Chassels & Melville, 2010; Crichton et al., 2021; Frick et al., 2010; Nami et al., 2016)

CONCLUSION

The Hybrid Collaborative Learning-based Lesson Study, oriented towards the Wahdatul Ulum paradigm, enhances pre-service biology teachers' lesson planning skills by developing key competencies such as formulating objectives, designing content, and structuring instructional steps. Each phase plays a vital role: the Learn Phase builds theoretical knowledge, the Plan Phase focuses on application, the Implement Phase provides hands-on teaching experience, and the See and Reflect Phases promote observation and refinement, bridging theory and practice.

Despite its benefits, challenges such as understanding instructional model syntax, managing classrooms, and reaching consensus in group work were observed. Future studies should explore strategies to improve pre-service teachers' understanding of diverse teaching models, strengthen collaborative dynamics, and integrate technology into lesson planning. Additionally, examining its long-term impact on teaching performance in real classrooms would provide valuable insights into its effectiveness and sustainability.

REFERENCES

Bjuland, R., & Mosvold, R. (2015). Lesson study in teacher education: Learning from a challenging case. *Teaching and Teacher Education*, *52*, 83–90. https://doi.org/10.1016/j.tate.2015.09.005

Chassels, C., & Melville, W. (2010). Collaborative, reflective, and iterative Japanese lesson study in an initial teacher education program: Benefits and challenges. *Canadian Journal of Education Revue Canadienne De l'éducation*, *32*(4), 734–763.

Chen, S., & Zhang, B. (2019). Improving Prospective Teachers' Lesson Planning Knowledge and Skills through Lesson Study. In R. Huang, A. Takahashi, & J. P. Da Ponte (Eds.), *Theory and Practice of Lesson Study in Mathematics* (pp. 549–575). Springer International Publishing. https://doi.org/10.1007/978-3-030-04031-4_27

Cresswell, J. W. (2012). *Educational Research. Planning, Conducting, and Evaluating Quantitative and Qualitative Research 4th Edition*. Pearson International Edition.

Crichton, H., Valdera Gil, F., & Hadfield, C. (2021). Reflections on peer micro-teaching: Raising questions about theory-informed practice. *Reflective Practice*, *22*(3), 345–362. https://doi.org/10.1080/14623943.2021.1892621

Damayanti, S. (2019). The Challenges Faced by the Model Teachers in Implementing Lesson Study. *Ethical Lingua: Journal of Language Teaching and Literature*, *6*(1), 40–44.

https://doi.org/10.30605/ethicallingua.v6i1.1170

Ernawati, E., & Safitri, R. (2017). Analisis kesulitan guru dalam merancang Rencana Pelaksanaan Pembelajaran mata pelajaran fisika berdasarkan Kurikulum 2013 di kota Banda Aceh. *Jurnal Pendidikan Sains Indonesia*, *5*(2), 49–56. https://doi.org/10.24815/jpsi.v5i2.9817

Farhang, Q., Hashemi, S. S. A., & Ghorianfar, S. M. (2023). Lesson Plan and Its Importance in Teaching Process. *International Journal of Current Science Research and Review*, *06*(08). https://doi.org/10.47191/ijcsrr/V6-i8-57

Frick, L., Carl, A., & Beets, P. (2010). Reflection as learning about the self in context: Mentoring as catalyst for reflective development in pre-service teachers. *South African Journal of Education*, *30*, 421–437.

Ganesh, B., & Matteson, S. M. (2010). The Benefits of Reteaching Lessons in Preservice Methods Classes. *Action in Teacher Education*, *32*(4), 52–60. https://doi.org/10.1080/01626620.2010.549718

Golightly, A., & Westhuizen, C. P. V. D. (2016). An assessment of Hybrid Collaborative Learning in geography micro-teaching: A South African case study. *International Journal of Educational Sciences*, *12*(2), 139–154. https://doi.org/10.1080/09751122.2016.11890421

Gutierez, S. B. (2021). Collaborative lesson planning as a positive 'dissonance' to the teachers' individual planning practices: Characterizing the features through reflections-on-action. *Teacher Development*, *25*(1), 37–52. https://doi.org/10.1080/13664530.2020.1856177

Harahap, S., Simamora, A., Nuruddin, A., Azmi, F., Nasution, H. B., Muzakkir, Siahaan, A., Safaruddin, Zulham, Soiman, Jamil, M., Syahminan, Mhd., & Siregar, P. (2019). *Wahdatul 'Ulum Paradigma Intergrasi Keilmuan dan Karakter Lulusan Universitas Islam Negeri Sumatera Utara Medan*. IAIN Press.

Hervas, G., Medina, J. L., & Sandín, M. P. (2020). Participants' views of the use of video in lesson study in higher education in Spain: An exploratory multiple case study. *Journal of Research on Technology in Education*, *52*(4), 461–473. https://doi.org/10.1080/15391523.2020.1734509

Irzawati, I. (2023). The pros and cons of integrating collaborative learning into lesson plan design. *PROGRES PENDIDIKAN*, *4*(1), 1–11. https://doi.org/10.29303/prospek.v4i1.325

Jayanti, U. N. A. D. (2022). Lesson Study berbasis Hybrid Collaborative Learning berorientasi Wahdatul Ulum: Deskripsi proses dan hasil belajar mahasiswa. *BEST Journal (Biology Education, Sains and Technology)*, *5*(2), 410–415.

Jayanti, U. N. A. D., Adlini, M. N., & Khairuna, K. (2020). Profil keterampilan menyusun skenario pembelajaran mahasiswa calon guru biologi perguruan tinggi keagamaan. *Jurnal Biolokus*, *3*(1), 265. https://doi.org/10.30821/biolokus.v3i1.720

John, P. D. (2006). Lesson planning and the student teacher: thinking the dominant model. *Journal of Curriculum Studies*, *38*(4), 483–498. https://doi.org/10.1080/00220270500363620

Karlström, M., & Hamza, K. (2021). How Do We Teach Planning to Pre-service Teachers – A Tentative Model. *Journal of Science Teacher Education*, *32*(6), 664–685. https://doi.org/10.1080/1046560X.2021.1875163

König, J., Bremerich-Vos, A., Buchholtz, C., Fladung, I., & Glutsch, N. (2020). Pre–service teachers' generic and subject-specific lesson-planning skills: On learning adaptive teaching during initial teacher education. *European Journal of Teacher Education*, *43*(2), 131–150.

https://doi.org/10.1080/02619768.2019.1679115

Leedy, P. D., & Ormrod, J. E. (2015). *Practical Research. Planning and Design 11th Edition*. Pearson Education.

Lewis, C., Friedkin, S., Emerson, K., Henn, L., & Goldsmith, L. (2019). How Does Lesson Study Work? Toward a Theory of Lesson Study Process and Impact. In R. Huang, A. Takahashi, & J. P. Da Ponte (Eds.), *Theory and Practice of Lesson Study in Mathematics* (pp. 13–37). Springer International Publishing. https://doi.org/10.1007/978-3-030-04031-4_2

McDuff, E. (2012). Collaborative Learning in an Undergraduate Theory Course: An Assessment of Goals and Outcomes. *Teaching Sociology*, *40*(2), 166–176. https://doi.org/10.1177/0092055X12437968

Mostofo, J. (2014). The impact of using lesson study with pre-service mathematics teachers. *Journal of Instructional Research*, *3*, 55–63.

Mutton, T., Hagger, H., & Burn, K. (2011). Learning to plan, planning to learn: The developing expertise of beginning teachers. *Teachers and Teaching*, *17*(4), 399–416. https://doi.org/10.1080/13540602.2011.580516

Nami, F., Marandi, S. S., & Sotoudehnama, E. (2016). CALL teacher professional growth through lesson study practice: An investigation into EFL teachers' perceptions. *Computer Assisted Language Learning*, *29*(4), 658–682. https://doi.org/10.1080/09588221.2015.1016439

Nunung, A. (2021). *Identifikasi Kesulitan dalam Penyusunan Rencana Pelaksanaan Pembelajaran (RPP) Kurikulum 2013 di Sekolah Dasar Gugus 1 Kediri Tahun Ajaran 2020/2021* [Universitas Mataram]. http://eprints.unram.ac.id/20713/

Okolie, U. C., Mlanga, S., Oyerinde, D. O., Olaniyi, N. O., & Chucks, M. E. (2022). Collaborative learning and student engagement in practical skills acquisition. *Innovations in Education and Teaching International*, *59*(6), 669–678. https://doi.org/10.1080/14703297.2021.1929395

Ravindra, J. R. (2015). Use of web-based instruction in teaching learning an innovative practice of the Institute. *Research Front*, *2*, 207–210.

Richards, J. C., & Farrell, T. S. C. (2011). *Practice Teaching: A Reflective Approach* (1st ed.). Cambridge University Press. https://doi.org/10.1017/CBO9781139151535

Rohayati, E., Diana, S. W., & Priyandoko, D. (2018). Lesson plan profile of senior high school biology teachers in Subang. *Journal of Physics: Conference Series*, *1013*, 012003. https://doi.org/10.1088/1742-6596/1013/1/012003

Rusznyak, L., & Walton, E. (2011). Lesson planning guidelines for student teachers: A scaffold for the development of pedagogical content knowledge. *Education as Change*, *15*(2), 271–285. https://doi.org/10.1080/16823206.2011.619141

Ruys, I., Keer, H. V., & Aelterman, A. (2012). Examining pre-service teacher competence in lesson planning pertaining to collaborative learning. *Journal of Curriculum Studies*, *44*(3), 349–379. https://doi.org/10.1080/00220272.2012.675355

Siregar, P., Betawi, I., & Ababil, J. B. (2019). *Paradigma Wahdah Al-'Ulum Perspektif Transdisipliner*. PT Raja Grafindo Persada.

Strijbos, J.-W., & Fischer, F. (2007). Methodological challenges for collaborative learning research. *Learning and Instruction*, *17*(4), 389–393. https://doi.org/10.1016/j.learninstruc.2007.03.004

Sugiyono. (2014). *Metode Penelitian Pendidikan: Pendekatan Kuantitatif, Kualitatif dan R&D*. Alfabeta.

Susena, Triwahyuningsih, Supriyadi, & Arief, D. B. (2016). Kesulitan-kesulitan guru dalam mengembangkan Rencana Pelaksanaan Pembelajaran (RPP) mata pelajaran Pendidkan Kewarganegaraan (PKn) Kurikulum 2013 di SMP Se Kota Yogyakarta. *The Progressive and Fun Education Seminar*. The Progressive and Fun Education Seminar, Yogyakarta. http://publikasiilmiah.ums.ac.id/handle/11617/7649

Thomas, D. R. (2006). A general inductive approach for analyzing qualitative evaluation data. *American Journal of Evaluation*, *27*(2), 237–246. https://doi.org/10.1177/1098214005283748

Vygotsky, L. S., & Cole, M. (1978). *Mind in Society: Development of Higher Psychological Processes*. Harvard University Press.

Widjaja, W., Vale, C., Groves, S., & Doig, B. (2017). Teachers' professional growth through engagement with lesson study. *Journal of Mathematics Teacher Education*, *20*(4), 357–383. https://doi.org/10.1007/s10857-015-9341-8

Yi Jia. (2005). Building a Web-Based Collaborative Learning Environment. *2005 6th International Conference on Information Technology Based Higher Education and Training*, F2D-7-F2D-9. https://doi.org/10.1109/ITHET.2005.1560279

Zaragoza, A., Seidel, T., & Santagata, R. (2023). Lesson analysis and plan template: Scaffolding preservice teachers' application of professional knowledge to lesson planning. *Journal of Curriculum Studies*, *55*(2), 138–152. https://doi.org/10.1080/00220272.2023.2182650