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Learning Model Inquiry-Based Local Wisdom Dilemmas Stories and Their Effects on Critical Thinking and Scientific Writing Abilities

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Abstract. The findings of this study reveal a mismatch between competence criteria and the reality of students' critical thinking and scientific writing abilities. As a result, it is critical to find a solution to this problem as soon as possible. This study aims to implement the inquiry-based learning model of local wisdom dilemmas stories (ILWDS) and examine its effect on improving critical thinking and writing abilities. The research design is a quasi-experimental pretest-posttest control group design. The research sample consisted of 2 senior high schools—the samples consisted of 62 students in the experimental and 62 in the control group. Data on students' critical thinking abilities were obtained through test instruments. The data obtained were analyzed descriptively and inferentially using MANOVA. Additional studies to evaluate the number of the treatment's effects on the capacity to think critically and write scientifically used Cohen's d equation. The results showed that the mean score of the experimental group's critical thinking abilities and scientific writing was higher than that of the control group. The results of the MANOVA analysis show that there is a significant influence of the ILWDS learning model on students' critical thinking abilities and scientific writing. This model is effective in the high category. Therefore, the ILWDS learning model is recommended to be applied in senior high

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schools which need help improving critical thinking abilities and scientific writing.

Keywords: critical thinking; local wisdom; dilemmas stories; scientific writing

1. Introduction

The ultimate goal of education is to prepare students to become professionals in their professions and be able to contribute to their communities. Achieving this goal has been one of the most challenging difficulties of this century. Many believe critical thinking and problem-solving abilities will be the new basis for 21st-century education (Trilling & Fadel, 2009). Critical thinking is essential for students since it is seen as a distinguishing quality of an educated individual and a requirement for becoming an active and engaged employee and citizen of the world (Laura & Paul, 2010).

Writing ability is essential since it is a kind of indirect communication in which someone expresses ideas, concepts, and thoughts in written language that others may read and understand (Astawa et al., 2017; Fu et al., 2019). According to Khosronejad et al. (2021), writing abilities need students to be more mindful and sensitive to their surroundings; when delivering reports, students must use appropriate language and punctuation. In language learning, writing abilities need to be one of the specific goals as a basic ability to think and communicate in everyday life and to learn other sciences. Oviyanti (2017) states that it is necessary to build children's ability to communicate because the ability to do so is the skill most needed in learning. In communicating with other people, a tool is needed, namely language. This view is reinforced by Herring (2005), stating that language is a means of communication by a person in association with others. The use of language becomes effective since it enables an individual to communicate with others. Several abilities in learning in the 21st century need to be empowered in scientific writing.

Students need scientific writing abilities to be more skilled in constructing an argument, checking the credibility of sources, making decisions and solving problems, and responding to various complex challenges (Braasch & Bråten, 2017; Liu et al., 2014). Scientific thinking makes it possible to harness the potential of seeing problems, solving problems, and creating and realizing oneself. Implementing learning writing abilities facilitates students to think critically about the characteristics of the subjects and learning materials. Be able to think critically supports the achievement of the core competencies of language learning.

Critical thinking is the capacity to solve issues based on reflective study and assessment of information/knowledge (Ennis, 2018). The characteristics of critical thinking require a person to demonstrate abilities such as interpretation, inference, analysis, explanation, self-regulation (Facione, 2020), evaluation, and decision-making (Verawati et al., 2020; Wahidin & Romli, 2020) all of which are relevant to the demands of 21th-century learning. Scientific writing abilities need to be the main goal in language learning so that every student can become a critical

thinker; this can be seen from his abilities in interpreting, analyzing, evaluating, concluding, explaining what he thinks and making decisions, applying the power of scientific thinking to himself, and improving the ability to think critically about the opinions he forms. Stupple et al. (2017) stated that scientific writing abilities are an important focus in school education and are very important for good academic achievement. Indonesian language learning is directed at developing language abilities that make students independent in life, creative, and able to solve problems using language abilities. Therefore, encouraging improving students' critical thinking abilities is an important outcome of learning. Educational institutions must be responsible for facilitating the improvement of students' critical thinking abilities and scientific writing.

Previous study indicates that critical thinking abilities in the United States (Reynders et al., 2020), Turkey (Ayçiçek, 2021), and the Netherlands (Janssen et al., 2019) remain poor and require effective learning to improve. According to research in Indonesia, the critical thinking abilities of junior high school students (Ariza Rahmadana Hidayati et al., 2021; Dewi et al., 2018) and high school students (Elfrida et al., 2017; Sudrajat et al., 2021) are inadequate. Students' writing abilities still need attention to be improved in learning using the inquiry model (Ali & Ulker, 2020; Cetin & Eymur, 2017; Erenler & Cetin, 2019; Hamsina, 2020; Palupi et al., 2020), which can facilitate students to be more independent in building their understanding and being meaningful and can contribute to improving critical thinking abilities (Lin et al., 2021; Maknun, 2020). Building a classroom learning environment that focuses on learning through inquiry is an important factor for effective classroom management (Garza & Arreguín-Anderson, 2018). It is necessary to frame language instruction in real-world situations so that students may communicate and develop relevant ideas outside of the classroom (Ahmed, 2017; Boot et al., 2017). The findings of this study reveal a mismatch between competence criteria and the reality of students' critical thinking and scientific writing abilities. As a result, it is critical to find a solution to this problem as soon as possible.

Students need more motivation to improve their critical thinking abilities and scientific writing. There is a relationship between motivation and learning effectiveness (Palittin et al., 2019). The model often used is that of inquiry, using the group discussion method through group presentations of literature study results with product resumes and PowerPoint slides. Implementing the inquiry model often experiences problems, namely, students' difficulties formulating problems by learning objectives. Students need help formulating problems; the formulation is not the main problem, so the problem-solving efforts need to be more appropriate. This causes inefficient management of learning time and low achievement of learning objectives. The ability to think critically and write scientifically does not emerge spontaneously; it must be fostered through various stimuli and contextual situations.

The theme of local wisdom in social, cultural, and religious life is integrated into the inquiry model in learning scientific writing materials. The inquiry model is based on local wisdom dilemmas stories to overcome the weaknesses of inquiry so that, in learning scientific writing material in formulating problems and

collecting student data, the theme remains consistent with local wisdom dilemmas stories. Learning based on local wisdom dilemmas stories is recommended in language learning to improve critical thinking abilities (Martínez & Mejía, 2020; Smith et al., 2020; Taylor, 2018). This study believes that cultivating local wisdom values dilemmas stories will succeed if supported by the surrounding socio-cultural environment (Adhikari et al., 2017; Scott-Weich & Yaden, 2017). In the context of the socio-cultural environment around students, the school, home environment and community have a very important role in supporting efforts to socialize and instill and even preserve the values of the local wisdom dilemmas stories. Schools must build educational programs, especially those with local wisdom dilemmas stories. These activities can be demonstrated in learning or outdoor learning as extracurricular activities. Learning based on local wisdom dilemmas stories supports improving critical thinking abilities and scientific writing because it facilitates students to carry out each stage of inquiry, thereby helping to increase students' understanding of social and cultural values in society. This analysis determined that the inquiry model was integrated with the concept of local wisdom dilemmas stories. A new learning model was formed called inquiry-based local wisdom dilemmas stories (ILWDS).

This research is significant in overcoming the shortcomings of prior learning systems that may have enhanced students' critical thinking and scientific writing abilities more successfully. The findings of this study give information regarding novel learning techniques and learning processes designed based on theory and material features to be more successful in developing students' critical thinking and scientific writing abilities. The goal is to see if the ILWDS learning paradigm can improve students' critical thinking and writing abilities. The following research questions are created from the difficulties stated in this study: (1) Is there an increase in students' critical thinking abilities in the experimental group compared to the control group? (2) Is there an increase in students' scientific writing abilities in the experimental group compared to the control group? (3) How effectively is the ILWDS learning model improving students' critical thinking abilities? (4) How effectively is the ILWDS learning model improving students' scientific writing abilities?

2. Literature Review

2.1 Critical Thinking Ability

Definitions come from various perspectives, from philosophy to cognitive psychology (Ennis, 2018). Descriptions frequently contain references to abilities such as approaching issues from several perspectives, connecting past knowledge with new knowledge, active listening, drawing conclusions, analyzing, synthesizing information, applying knowledge, and finding parallels and contrasts. There is a need to develop rational, introspective, self-correcting, accountable, and proficient critical thinking (Hoffmann, 2018). Critical thinking is the deliberate, persistent, and rigorous examination of a belief or purported type of knowledge by assessing the foundations that support it and the further implications that it tends to imply (Alkhatib, 2019). Most definitions of critical thinking cover some general points that critical thinking is based on information gathered before and requires a process of questioning, analyzing, and

synthesizing information (Wale & Bishaw, 2020) that can result in principled or reasoned actions (Buck & Vlachos, 2021).

Critical thinking is thinking rationally and orderly to understand the relationship between ideas and/or facts (Heard et al., 2020). An orderly, coherent, and systematic delivery technique is needed so that ideas can be conveyed and received by readers correctly. Writing that is not systematic means the message is not conveyed completely. Continuous practice and process are needed in critical thinking.

The synthesis of indicators of critical thinking abilities is carried out based on the formulation of experts. This synthesis is carried out because it adapts to the model syntax and learning materials. The synthesis of indicators of critical thinking abilities is presented in Table 1.

Table 1: Synthesis of Critical Thinking Ability Indicators

Ennis (2018)	Fisher (2007)	Johnson (2011)	Synthesis Results
Formulate the main issues	Identify the problem	Solve the problem	Formulate the problem
Reveal the facts	Gather various relevant information	Make decisions	Evaluate arguments
Choose logical arguments	Develop several alternative solutions to the problem	Persuade	Consider the credibility of the data
Detects bias with different viewing angles	Make inferences	Analyze assumptions	Make inferences
Draw conclusions	Express opinion	Conduct scientific research	Make the right decisions in solving problems
	Evaluate arguments		

Sources: Fisher (2007), Johnson (2011), Ennis (2018).

The results of the synthesis obtained indicators of critical thinking abilities according to researchers, namely (1) formulating problems; (2) evaluating arguments; (3) considering the credibility of the data; (4) making conclusions; and (5) making the right decision in solving the problem.

2.2 Scientific Writing

Writing is a process of expressing an idea/idea in written form. No matter how good the idea is, if conveyed in a systematic written form, part of the mission will succeed (Blankstein, 2004). For an idea to be properly conveyed and received by the reader, it requires an orderly, coherent, and systematic presentation technique. Therefore, writing is an activity of reasoning or critical thinking. Writing can foster courage and encourage you to seek as much information as possible (Howard, 2022). Scientific writing is an activity for learning and imparting knowledge (Huda, 2019). In writing, one must pay attention to the efficiency factor. That is, everything conveyed can be understood by the reader. So, scientific

writing is a person's ability to express ideas through written media. Submission of this idea requires a process of thinking and reasoning. Everything written results from understanding and analysis and indirectly relates to general knowledge with other people. A writer must have abilities, use graphology, vocabulary and language structure well, and be well-read. Likewise, to train students' scientific writing abilities, they must be able to develop their ideas in the form of a text with structure and language according to the correct rules.

Indicators of scientific writing abilities in this study were determined through the results of the synthesis of experts, as shown in Table 2.

Table 2: Synthesis of Indicators of Scientific Writing Abilities

Free Learning Curriculum (2022)	**Wolfe (2007)**	**Grimberg and Hand (2009)**	**Synthesis results**
Dissecting the structure, content, and language of scientific work	Context	Observation	Writing background
Finding problems, choosing topics, writing scientific paper titles	Thesis	Measurement	Write a problem statement
Write the background of the problem, the formulation, and the purpose of writing scientific papers	Navigation	Comparison	Write goals
Write quotations and reference sources ethically according to applicable rules	Proof	Analogy	Write citations and reference sources
Writing research methods in scientific writing	Counter argument	Clarification	Write down the scientific method
Write down research results, conclusions, and suggestions	Conclusion	Statement	Write down the results
		Cause and effect	Write down arguments
		Induction/generalization	Write conclusions and suggestions
		Deduction	
		Investigation design	
		Argument	

Sources: Wolfe (2007), Grimberg & Hand (2009), Harsono et al. (2022)

2.3 Dilemmas Stories

Dilemmas stories in learning are a collection of stories that contain dilemma elements so that students are motivated to learn and have a deeper understanding and are designed to motivate students' abilities to make decisions and solve problems (Taylor et al., 2009). The stories in dilemmas contain dilemmas usually

related to the local cultural context in everyday life. Some countries develop contexts in dilemmas stories as described by Taylor et al. (2009), namely (1) the dilemma of mining, (2) the dilemma of fish and rice (food), (3) the dilemma of nuclear power, (4) the dilemma of climate change, and (5) the dilemma of Pakistan.

Dilemmas stories-based learning prioritizes contextual learning through stories that cause dilemmas related to problems in everyday life (Rahmawati, 2018). So learning with a dilemma stories approach is learning by raising issues of both the themes of science, technology, art, culture and or humanities that are controversial and contemporary through stories that give rise to dilemmas.

Dilemmas stories in this study are used to present a phenomenon so that teaching material texts based on dilemmas stories are composed. The teaching materials are used to implement the inquiry learning model, so a new learning strategy is formed with a dilemma stories approach. This learning strategy is projected to improve critical thinking abilities. The implementation of learning with the dilemma stories approach is shown in Table 3.

Table 3: Implementation of Learning Strategies with Dilemmas Stories Approach

Learning Steps	Implementation
Discourse observation	Observing the text in the form of articles with the theme of a dilemma problem (story, culture, environment)
Formulate the problem	Question critical solutions based on the text
Collect and analyze data	That is done by extracting information from various literature/sources and then discussing the pros/cons of the discourse.
Knowledge synthesis	Synthesize comprehensive knowledge from various literature/sources and discussions related to the problem and write it as a scientific text.
Communicate	Delivering the results of knowledge synthesis in writing and orally

3. Method

3.1 Research Design

That is a quasi-experimental pretest-posttest non-equivalent control group study. The experimental group was given ILWDS learning while the control group was taught with a model often used at the school, namely the inquiry model.

3.2 Sample and Data Collection

The population of this study were students of class XI at two high schools in Pekalongan Regency. Class XI was determined as a participant because their critical thinking abilities had stayed the same.

Senior high school in Pekalongan Regency has three qualifications based on the assessment of the National Accreditation Board: good, medium and poor. Therefore, the sampling in this study was set at two high schools with moderate qualifications. The experimental group was class XI.IPS.1 State Senior High School of Paninggaran with 32 people and class XI.IPS.1 State Senior High School of

Kandangserang with 30 people. The control group was class XI.IPS.2 State Senior High School of Paninggaran with 32 people and class XI.IPS.2 State Senior High School of Kandangserang with 30 people. The number of samples in the experimental group was 62 students, and the control group was 62 students, so the total number of participants in this study was 124. Learning in the experimental and control classes uses the same model, namely inquiry and the same material, namely writing scientific papers. The differentiating factor in the treatment of the two groups was that the experimental class used the ILWDS, while the control class did not use the dilemmas stories approach.

Learning for the implementation of the experiment was carried out in four meetings every two hours of lessons (2 x 45 minutes). Scientific writing material was held at four different meetings so that there were four examples of texts on local wisdom dilemmas stories that students studied. Observations were made using observation guidelines in the form of checklists for both groups to monitor the implementation of learning. In the experimental group, observations were focused on the appropriateness of the ILWDS measures. In the control group, observations were focused on learning steps without dilemma stories. Learning techniques in the experimental group included: (1) observing scientific texts in the form of articles with dilemmatic problem themes; (2) questioning critical solutions based on the text; (3) extracting information from various literature/sources and then discussing the pros/cons of the discourse; (4) synthesizing comprehensive knowledge from various literature/sources and discussions related to the problem and writing it in the form of scientific texts; and (5) conveying the results of knowledge synthesis in writing or orally.

3.3 Instruments

The tool consists of pretest and posttest questions to assess students' critical thinking abilities. The questions comprise ten descriptions of things that reflect five indications of critical thinking abilities. In this study, indicators of critical thinking abilities include: (1) issue formulation; (2) argument evaluation; (3) data credibility consideration; (4) concluding; and (5) making the correct decision in problem-solving. The weight of the correct answer is in the range of 1-10, with criteria according to the assessment guidelines that have been developed. The instrument is in the form of pretest and posttest questions to measure students' scientific writing abilities. The questions consist of eight items in the form of descriptions representing eight indicators of scientific writing abilities which are formulated in this study, namely (1) writing background, (2) writing problem formulation, (3) writing objectives, (4) writing quotations and reference sources, (5) writing the scientific method, (6) writing the results, (7) writing arguments, and (8) writing conclusions and suggestions. The weight of the correct answer is in the range of 1-5 with criteria according to the assessment guidelines that have been developed. The final score is then converted to a score range of 0-100. The replies of instructors and students determine the ILWDS model's applicability. A Likert scale questionnaire collected instructor and student reactions to the ILWDS learning paradigm. According to Nieveen (2006), the practical features of the learning model are implementation, efficiency, and effectiveness. Efficiency is defined as having enough time, effort, and money while learning effective syntax

is directed toward achieving learning goals. Each dimension is made up of five different attitude statements.

The instrument's content validity for critical thinking abilities and scientific writing was tested using the Aiken formula with five expert raters. All items' Aiken coefficients on critical thinking ability are above the Aiken coefficient threshold (0.80) so that all items meet content validity. Construct validity test with Confirmatory Factor Analysis (CFA) used Linear Structural Model (Lisrel). Confirmatory factor analysis shows that the value of the Root Mean Square Error of Approximation (RMSEA) is 0.043 < 0.08, the Chi-Square/df obtained from the test is 1.50 <2, and the Goodness of Fit Index (GFI) is 0.98 > 0.90 or the model stated is by the data obtained in the field and can be used in measurements. Assessment of the reliability of the measurement model includes Composite Reliability (CR) with a value of 0.89, and Average Variance Extracted (AVE) with a value of 0.51, indicating that the instrument is in the reliable category. The ILWDS learning model was developed by authors and validated using the Delphi technique by five experts, rated four and met the valid criteria based on the Aiken formula, with a minimum score of 0.8.

3.4 Data Analysis

The experimental and control group were first equated before implementing the learning model by measuring both groups' critical and creative thinking abilities (Ary et al., 2018). The F test compares the experimental and control classes' equivalence. If F count F table, the classes are equal (0.05; df1; df2). The Shapiro-Wilk findings are used in the normality test, while the Levene test is used in the homogeneity test. If the p-value found is more than 0.05, the data are considered to be regularly distributed (p > 0.05). If the p-value found is more than 0.05, the data are considered homogenous (p > 0.05).

The efficacy test was evaluated using one-way MANOVA analysis and the SPSS software. Cohen's d formula is used to calculate the magnitude of the influence of the ILWDS learning model on enhancing critical thinking abilities and scientific writing. The increase in students' critical thinking and scientific writing abilities was tested using the normalized gain test. The ILWDS practicality data were assessed descriptively and qualitatively.

4. Results

4.1 Comparison of Critical Thinking and Scientific Writing Abilities of the Experimental and Control Groups

The observation results show that the experimental class tends to be more active when learning takes place than the control class. Experimental group students were more motivated to participate in discussions and argue. That is because students are familiar with the theme of local wisdom in the topic of discourse presented by the teacher. Through the approach of dilemma stories on the topic of local wisdom discourse, they can also develop ideas and arguments related to social, cultural, and environmental values.

Students' critical thinking and scientific writing abilities in the experimental group compared to the control group are presented in Table 4.

Table 4: Descriptive Statistics of Post-Test Critical Thinking and Scientific Writing Abilities

Variables	Group	Means	std. Deviation	N
Critical Thinking	Experiment	79.3226	5.09508	62
	Control	72.2258	4.06674	62
Scientific Writing	Experiment	81.2903	3.96558	62
	Control	72.9839	3.94217	62

Table 4 summarizes the results of the posttest descriptive statistical analysis. The average posttest ability to think critically and write scientifically from implementing ILWDS by the experimental group is higher than the average ability to think critically and write scientifically from implementing the inquiry learning model by the control group. Under the ILWDS model, the standard deviation of critical thinking abilities and scientific writing is bigger than the standard deviation of the inquiry model. This big standard deviation number suggests that the data tend not to converge to the mean.

4.2 Results of Inferential Statistical Analysis on the Effectiveness of ILWDS in Developing all Aspects of Students' Critical Thinking and Writing Abilities

The inferential statistical formula used to test the hypothesis is MANOVA. So it is necessary to do prerequisite tests, including normality, homogeneity, and balance tests. Testing for normality ensures that the data distribution in the experimental and control groups is normal. The homogeneity test ensure that the data variation in the two groups is homogeneous. The balance test was carried out to ensure that the experimental group and controls had balanced initial competencies. The results of the data normality test using the Kolmogorov-Smirnova statistic with SPSS 22 are presented in Table 10. The distribution of the data is declared normal if the significance coefficient (Sig.) > 0.05. The normality test is presented in Table 5.

Table 5: Normality Test Results

Variables	Significance		Decision
	Experiment	control	
Critical Thinking	0.055	0.117	Normal
Scientific Writing	0.055	0.062	Normal

The homogeneity test (Levene) is presented in Table 6.

Table 6: Homogeneity Test Results

Variables	Significance	Decision
Critical Thinking	0.288	Homogeneous
Scientific Writing	0.827	Homogeneous

Table 6 shows that the significant value of both variables is > 0.05, so it can be concluded that the two groups are homogeneous in both variables. Scientific writing skill pretest data is used by applying the t-test formula to carry out the balance test. If the coefficient on the significance of the t-test is greater than 0.05 (5%), it can be stated that the initial abilities of the experimental and control

groups are balanced. The results of the analysis with the t-test are presented in Table 7.

Table 7: Balance Test Results

Variables	T	df	Sig. (2-tailed)	Mean Differences	std. Error Difference
Critical Thinking	2.404	122	058	3.64516	1.51599
Scientific Writing	-.026	122	.979	-.04032	1.54153

The prerequisite test shows that the data on the ability to think critically and write scientifically in both groups are normally distributed. It is also known that the experimental and study classes are homogeneous and balanced. These results meet the requirements for the parametric test. Then the MANOVA test was carried out, presented in Table 8, and tests of between-subjects effects are in Table 9.

Table 8: Multivariate Tests

Learning Model Effects	**Value**	**F**	**Hypothesis df**	**df errors**	**Sig.**
Pillai's Trace	.545	72510	2,000	121,000	.000
Wilks' Lambda	.455	72510	2,000	121,000	.000
Hotelling's Trace	1,199	72510	2,000	121,000	.000
Roy's Largest Root	1,199	72510	2,000	121,000	.000

Table 9: Tests of Between-Subjects Effects

Source	**Dependent Variables**	**Type III Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Corrected Model	Critical Thinking	1561.290 a	1	1561290	73,476	.000
	Scientific Writing	2138.911b _	1	2138911	136,818	.000
Intercepts	Critical Thinking	711974.323	1	711974.32	33506.13	.000
	Scientific Writing	737816.331	1	737816.33	47195.28	.000
Group	Critical Thinking	1561290	1	1561290	73,476	.000
	Scientific Writing	2138911	1	2138911	136,818	.000

The significance of the p-values is less than 0.05, as shown in Table 8. As a result, with 95% confidence, the learning model substantially affects the dependent variable.

The significance value of critical thinking abilities and scientific writing is less than 0.05, according to the source of the learning model table in Table 9, indicating that there is a significant difference in the effect of the ILWDS learning model and the inquiry model on students' critical thinking abilities and scientific writing. Furthermore, to find out the magnitude of the effect of implementing the ILWDS learning model by looking at the effect size coefficient as presented in Table 10.

Table 10: Effect Size Test Results

Variables	**Coefficient**	**Decision**
Critical Thinking	1.78	High
Scientific Writing	1.73	High

Table 10 shows that the ILWDS learning model is more effective than the inquiry model in improving critical thinking abilities and scientific writing, both of which are in the high category. The results of the N-gain calculation obtained an increase in critical thinking abilities of 0.37 and scientific writing abilities of 0.41, both of which are in the medium category.

5. Discussion

The ILWDS learning model is the development of a model from the inquiry syntax by presenting dilemmatic discourse in the daily life of the local community as a way of thinking and behaving in solving problems in learning. The ILWDS learning model was developed through the main model. The inquiry was then refined based on the characteristics of the material. It analyzed the social system where discussion/debate and 3-way communication are needed, namely educators and students, as well as between students. Analysis was undertaken of the principle of reaction, in which educators must be able to grow students' competence by stimulating their critical thinking through dilemmatic problems. Lastly is an analysis of constructional and accompanying impacts, namely students' critical thinking abilities and scientific writing. It is necessary to modify the syntax of the inquiry model by involving students more in orientation toward local wisdom phenomena and responding to them from various perspectives to increase the effectiveness of the ILWDS model. The modified syntax is integrated with the dilemma stories approach, resulting in the development of a new model called ILWDS. The ILWDS model is more effective than the inquiry model in improving critical thinking abilities and scientific writing.

The ILWDS model's syntax includes five phases: observing discourse, formulating problems, collecting and analyzing data, synthesizing knowledge, and communicating. The ILWDS learning model can improve scientific writing abilities because its syntax, among other things, has a discourse observation syntax as a provision for students writing scientific work backgrounds. The syntax of formulating problems facilitates students in formulating problems and goals in writing scientific papers. The syntax of collecting and analyzing data facilitates students in writing the methods and results of a scientific paper. Through the knowledge synthesis syntax, it facilitates students to be able to write scientific results and arguments. Moreover, the syntax of communicating facilitates students in writing arguments and conclusions in scientific work.

The ILWDS model has the advantage of incorporating discourse-based learning of local wisdom dilemmas stories, raising pros and cons to foster critical thinking, discussion, and argument debate. The debate about the issue of local wisdom, which is reviewed from various perspectives and is even controversial, also requires students to develop many abilities and dispositions related to critical thinking. Students can argue and write a scientific paper through this critical thinking. Students can be more skilled in constructing an argument, checking the credibility of sources, or making decisions and solving problems by responding to various complex challenges through scientific writing abilities (Braasch & Bråten, 2017).

The ILWDS learning model has advantages over the inquiry model. Integrating the concept of local wisdom facilitates students in developing ideas or values, local views that are wise, full of wisdom, and of good value that are embedded and followed and implemented (Nugraha et al., 2017; Padur et al., 2017). The emergence of wisdom can maintain or filter the global culture affecting human life (Disi & Hartati, 2018; Mardawani & Jaya, 2019). Integrating dilemmas stories in learning motivates students to learn and have a deeper understanding and motivates their abilities to make decisions and solve problems (Taylor et al., 2009). The stories in dilemmas contain dilemmas usually related to the local cultural context in everyday life.

Learning using the ILWDS model is supported by three important things, namely, students tend to be (1) more active; (2) able to see an object with multiple perspectives; and (3) have broader information. Learners tend to be more active because they face dilemmatic phenomena facilitating students' curiosity and motivation to learn. Students build their understanding by responding to phenomena with critical thinking and multi perspectives. Students can work together in groups to discuss and dig up as much information as possible regarding social issues, respond to them from various perspectives and then build their knowledge.

The strength of the ILWDS syntax for improving scientific writing abilities is part of data collection and analysis, knowledge synthesis and communication. The data collection and analysis step facilitates students to critically review the information obtained and compare their previous experiences and knowledge so that cognitive assimilation occurs. The more perfectly the knowledge is processed, the better the chances of remembering that information (Woolfolk, 2009).

The knowledge synthesis stage facilitates students in the accommodation process so that new knowledge construction is formed. Students make accommodations based on the learning experience gained so that an adaptation process occurs, namely balancing new knowledge with previously owned cognitive so that they have a higher cognitive level than before (Hendrowati, 2015; Hurit et al., 2021).

The communication step is carried out to present the results of students' ideas in addressing and solutions to the problems of local wisdom dilemmas stories, as well as evaluating the ideas of others through a scientific paper and discourse. This step facilitates students in the synthesis of knowledge, arguments, ideas and development. The meaning of learning can be formed by providing information by communicating it to others through acceptance and presentation of learning (Luong et al., 2019). Students discover and understand difficult concepts more easily when they discuss problems among themselves (God & Zhang, 2019).

Discussion activities and other group criticism can help groups negotiate valid criteria. It can also increase understanding of the social construction of scientific knowledge and create a learning community as well as build cooperation to create a good learning environment. The ILWDS learning syntax guides students to develop their thoughts, ideas and arguments in written language. Examples of students' thoughts and ideas about local culture include the pros and cons of the

"Sintren Dance" culture. The culture is reviewed from various perspectives. Sintren dance is a typical Pekalongan (Central Java-Indonesia) dance with magical/mystical powers. The origin of this dance itself comes from the love story of Raden Sulandhono and Sulasih, the daughter of Kalisalak, Batang. The love of these two people was not sanctioned by Raden Sulandhono's parents, namely Ki Bahurekso and Dewi Rantamsari, so Raden Sulandhono chose to go ascetic.

In contrast, Sulasih chose to become a dancer. However, the two of them often had unseen meetings arranged by Dewi Rantamsari (Raden Sulandhono's mother) by inviting the Angel Spirit and the Spirit of Raden Sulandhono, who was in meditation, to enter and merge into Sulasih's body. Therefore, with his profession as a dancer, Sulasih is the icon for forming this Sintren Dance. This dance is performed by women who are still virgins accompanied by gendhing (Javanese traditional musical instrument) and wearing their distinctive clothing. This love story teaches that life's reality sometimes does not match what one wants. However, this story has yet to provide an example of how to solve a life problem regarding community and religious norms. Nevertheless, the story has created a local culture that can entertain the public. On the other hand, magical elements are not necessarily appropriate when viewed from other perspectives, such as social and religious.

The local wisdom approach and dilemmas stories have proven helpful in learning effectiveness. Among other things mentioned in previous research results, namely, by developing educational comics with a local perspective, they have increased the morality of elementary school students (Krisna et al., 2020). Local wisdom-based education can improve character among tertiary students (Hidayati et al., 2020). Incorporating local wisdom can develop global thinking in teaching foreign languages in Indonesia (Muharom Albantani & Madkur, 2018). Local wisdom-based models can improve elementary school students' higher-order thinking abilities and multiple intelligences (Agusta, 2021). Moreover, teachers' adaptation to ethical dilemma story pedagogies is effective in strategies for re-engaging students in continuing education (Taylor et al., 2013).

The support system in the ILWDS learning model in the form of teaching materials and student worksheets facilitates the learning process and assists in the effectiveness of these models. It has also been observed that specially created worksheets can assist children in enhancing their critical thinking abilities (Zulaiha et al., 2016). According to one study (Nwike & Catherine, 2013), students taught using specially created teaching materials have stronger critical thinking abilities than those not. According to Nussifera et al. (2017), students who use textbooks with diverse representations in learning have stronger critical thinking abilities than students who utilize traditional textbooks. E-books also increase pupils' critical thinking abilities (Qibtiya, 2018).

The ILWDS learning model correlates well with scientific writing abilities. In other words, this methodology has the potential to improve scientific writing. Because the range of student and teacher evaluation scores is in the third quartile and the maximum value, the ILWDS learning model received a very good reaction from teachers and students. This ILWDS learning model meets the practical

criteria of a learning model, which are as follows: (1) the model can be used to learn scientific writing material; (2) the effort, time, and cost of using an affordable model; and (3) the syntax of the ILWDS model is determined by the learning objective, which is to improve scientific writing abilities.

The advantages of this ILWDS learning model are (1) facilitating students to be more actively involved in learning; (2) explore information and develop broader knowledge; (3) be able to develop ideas to solve problems with multiple perspectives; and (4) has a syntax that is practical and easy to implement. Students obtain broader information because they can work together in groups to discuss and dig up as much information as possible regarding local cultural issues, react to it from various perspectives, build their knowledge, and write it down in a scientific paper. Based on this description, the ILWDS model is ideal, practical and effective in learning to write scientific papers.

The ILWDS learning model also has weaknesses, namely (1) it requires students' seriousness to prepare background knowledge independently in discourse observation; (2) students tend to have difficulty in finding and writing novelties on the backgrounds they write; (3) students have not been able to review a problem with in-depth discussion.

6. Conclusion

The ILWDS learning model improves critical thinking and scientific writing abilities more effectively than inquiry. Implementing this model can overcome problems in learning related to students' low ability in critical thinking and scientific writing. The syntax sequence of the ILWDS learning model has implications for facilitating students in improving critical thinking abilities and scientific writing. The ability to think critically and write scientifically is developed by collecting and analyzing data and synthesizing and communicating knowledge. In this step, students examine various kinds of literature, then respond critically from various perspectives and communicate their thoughts. The syntax of communicating also facilitates students to discuss openly and construct new knowledge. This step simultaneously evaluates other people's ideas through a discourse. It also facilitates students synthesizing knowledge, arguments, ideas and development and writing them in a scientific paper. Students must seriously carry out the previous syntax to implement a good ILWDS learning model.

The implications of the results of this study include that the ILWDS learning model can facilitate learning for adults and contribute to preparing students' 21st-century abilities related to critical and creative thinking, problem-solving, collaboration, and communication. The communication learning model teaches students to learn to develop their thoughts and ideas critically and communicate them through scientific writing and oral communication.

The ILWDS learning model effectively improves critical thinking and scientific writing, so this model is recommended for implementation. The challenge for further research is to facilitate students to analyze and write novelties in their written results and examine a problem with an in-depth discussion of the material for writing scientific papers.

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