ANALYSING STUDENTS' CRITICAL THINKING SKILLS THROUGH SOLO TAXONOMY IN ENGLISH LANGUAGE TEACHING: A DESCRIPTIVE STUDY

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Abstract

The quality of education in Indonesia still faces many challenges. It is based on the results of the Programme for International Student Assessment (PISA) showed that students' competencies in reading literacy, numeracy, and science are still below the average for OECD countries. Students still struggle to apply basic concepts and solve problems that require higher-order thinking skills (HOTS). Therefore, the study aims to analyze students' level of critical thinking skills through SOLO Taxonomy in English language teaching in SDIT Rabbi Radhiyya 02 in Rejang Lebong at fifth grade. This study used a descriptive study design with a mixed-methods orientation. The data were collected through triangulation by involving performance tasks, observations, and interviews, and were analysed using both manual coding (Excel) and NVivo. This study's findings showed that most students in SDIT Rabbi Radhiyya 02 Rejang Lebong at fifth grade still struggle to reach higher cognitive levels. Specifically, 60% of the 18 students were at the multi-structural level (LOTS), and 40% of the 12 students succeeded in reaching the high-order thinking skill, which was at the Relational level. This study aims to make a contribution to English teachers, curriculum developers, and school administrators about students' critical thinking skills level through SOLO Taxonomy in English language teaching. The findings may help educators design instructional activities that guide learners toward the highest level of critical thinking in the Extended Abstract level, where students can create, produce, generalize, and apply ideas across new contexts.

***Keywords**: Critical thinking, SOLO taxonomy, English Language Teaching, Descriptive study*

I INTRODUCTION

Indonesia continues to face substantial challenges in enhancing the quality of its education system, particularly in developing students' literacy, numeracy and scientific competencies. Data from Ministry of Education and International assessment indicate persistent gaps that require immediate attention. One of the most widely recognized international assessments, the Programme for International Student Assessment (PISA) reveals that Indonesian students consistently perform below the average of Organization for Economic Co-operation and Development (OECD) countries (Ismawati, 2023; Nugrahanto et al, 2019). According to OECD (2023), Indonesia's average scores in PISA 2022 declined compared to the 2018 cycle, with reading scores decreasing from 371 to 359, Mathematics from 379 to 366, and science from 396 to 383. This result suggested that many Indonesian students continue to experience difficulties in applying fundamental concepts and solving problems that demanded critical and analytical thinking skills. Furthermore, the PISA findings indicated that a considerable proportion of Indonesian students remain at the lower proficiency levels.

Most of students achieved only levels 1-3 of the PISA proficiency scale, which are generally associated with lower-order thinking skills (LOTS), such as recalling information and performing routines procedures. In contrast, students in many developed countries are more likely to attain levels 4-6, which require higher-order thinking skills (HOTS), including critical analyses, evaluation, and complex problem-solving (Yuliati & Lestari, 2018). Therefore, there is a growing need to implement effective teaching and learning strategies that support the development of higher-order thinking skills and improve students' academic performance (Masfufah & Afriansyah, 2021; Yusmar & Fadilah, 2023). Furthermore, the Central Statistics Agency (BPS) frequently reports that there are many differences in the quality of education in Indonesia between regions, both urban and rural areas, and between schools in central cities and remote areas. These gaps are not only in physical facilities but also in teacher quality, the availability of learning resources, and student academic achievement. This situation creates a worrying gap between future competency demands and the current education system's ability.

One of the factors that influenced the quality of education in Indonesia is the quality of the teachers. There are four competencies that the teacher must possess consist of professional competency, social competency, emotional competency and pedagogical competency (Konig et al, 2021; Blömeke, 2022). Pedagogical competency is a crucial skill that not only differentiates teachers from other professions but also greatly influences students' level of success in their learning journey (Rahmawati et

al, 2025). In addition, according to Indonesian Government Regulation No. 74 of 2008 concerning teachers, pedagogical competence is defined as the teacher's ability to manage the learning process effectively for students. These special competencies differentiate teachers from other professions, as highlighted by various studies (Ansori et al., 2021; Amini et al., 2022; Alwi & Mumtahana, 2023; Warman et al., 2022) . This reflects the teacher's ability to organize learning material in a way that makes it easy for students to understand (H et al., 2022; Ribosa & Duran, 2022; Sulasmi, 2022). Moreover, nowadays the government is concerned to improve the teacher's competency through PPG programme easily by piloting programme. So, the teacher who still young or experienced teachers that have dedication for a long time in a school, they have the same chance to follow the programme without waiting in line as long as they are registered in DAPODIK.

The achievement of optimal learning outcomes is closely associated with teachers' professional competence, as competent teachers are able to effectively manage classrooms and create positive learning environments that support students' academic development. To achieve the intended learning objectives, teacher must possess strong pedagogical skills that enable them to plan, implement, and evaluate learning activities effectively (Syata et al, 2024). In this regard, teachers are encouraged to continuously enhance their instructional competence and professional commitment to meet the demands of contemporary education. One of the essential aspects of pedagogical competence is the ability to manage and adapt learning activities, particularly when students have not yet achieved the expected learning outcomes (Alwi & Mumtahana, 2023).

As part of effective instructional practice, teachers need to develop students' thinking skills through meaningful learning experiences. Thinking skills are generally categorized into Lower-Order Thinking Skills (LOTS) and Higher-Order Thinking Skills (HOTS) (Shah et al, 2024). While LOTS focus on basic cognitive processes such as remembering and understanding, HOTS involve more complex processes, including analysing, evaluating, and creating. Both levels of thinking are essential in English language learning, as students require foundational knowledge before engaging in critical and creative thinking tasks. Therefore, maintaining LOTS and HOTS is crucial for promoting language proficiency while simultaneously developing students' critical and innovative thinking abilities (Finansu, 2025). In particular, the integration of HOTS into reading comprehension instruction is important because it enhances students' capacity to analyse, interpret, and critically evaluate texts (Maryamah et al, 2024). Furthermore, incorporating HOTS into classrooms activities can foster creativity and problem-solving skills, making it an essential component of the learning process for fostering students' critical and creative thinking skills.

This study aims to investigate the levels of students' critical thinking skills in English language Teaching among fifth-grade students of SDIT Rabbi Radhiyya 02 Rejang Lebong. The participants consist of one intact class and students' critical thinking skills are analysed using SOLO (Structured of the Observed Learning Outcome) Taxonomy. Specifically, this study seeks to answer the following research questions "What are the levels of students' critical thinking skills in English language teaching based on SOLO taxonomy?" The classification of the SOLO taxonomy levels used in this study is presented below:

Table 1. Verbs of SOLO taxonomy (J. Biggs & Tang, 2011)

No.	Level	Verbs
1.	Uni-structural	Memorizing, identifying, recognizing, counting, defining, drawing, finding, labelling, matching, mentioning, citing, remembering, reading, sequencing, telling, writing, imitating
2.	Multi-structural	Classify, explain, list, report, discuss, illustrate, select, tell, count, sort, outline, separate
3.	Relasional	Apply, integrate, analyse, explain, predict, conclude, summarize (summarize), review, argue, transfer, plan, characterize, compare, contrast, differentiate, organize, argue, make a case, compile, review and rewrite, check, translate, paraphrase, solve problems

4.	Extended abstract	Theorize, hypothesize, generalize, reflect, produce, create, compose, discover, initiate, prove with basic principles, create original cases, solve with basic principles

Studies that examine students' critical thinking levels remain relatively limited, particularly in the context of English Language Teaching. Although critical thinking has become an essential component of modern curricula, few researchers have analyzed it, particularly through the use of the SOLO Taxonomy." by using SOLO taxonomy. Therefore, this study aims to find out this gap by investigating students' critical thinking levels in ELT through the SOLO framework to provide insights for teachers, curriculum developers, and educational stakeholders.

II MATERIALS AND METHOD

2.1 SUBJECT AND SETTING

This study is a descriptive study design with a mixed-methods orientation to explore the levels of students' critical thinking as categorized by the SOLO Taxonomy in an English Language Teaching (ELT) context. According to (Creswell, 2007) a mixed methods research design is a procedure for collecting, analysing, and mixing both quantitative and qualitative methods in a single study or a series of studies to understand a research problem. The mixed-methods approach integrates quantitative scoring of students' work and qualitative analysis of their reasoning and reflection.

The participants consisted of all students enrolled in one fifth-grade English class at SDIT Rabbi Radhiyya 02 Rejang Lebong. The total of students were 30 students. Because the population of interest was limited to a single intact classroom. This study employed total population sampling, in which all members of the population were included in this study. The use of 30 participants is considered adequate for descriptive educational research, as it allows the researcher to identify patterns and variation in students' critical thinking levels within the target group while providing sufficient data for descriptive statistical analyses (Cohen et al, 2018). Furthermore, the entire class eliminates sampling bias within the selected group and ensures that the findings accurately represented the characteristics of the student in the classroom.

2.2 INSTRUMENT

The instruments of this study consist of (1) a SOLO-based task battery which is a set of graded ELT tasks (short-response, explanation, comparative analysis, problem-solving tasks, and a creation task) with clear instructions and time allocations. (2) SOLO scoring rubrics are 5-level rubric adapted to the specific language tasks that list observable criteria for each SOLO level, adapted from (J. B. Biggs et al., 2014) e.g., Unistructural: identifies one relevant idea; multi-structural: lists several relevant ideas; Relational: integrates ideas; Extended Abstract: generalizes or applies conceptually to a new context. (3) Observation checklist that capture evidence of questioning and peer interaction (4) Semi-structured interview guide to get the explanations, reasoning strategies, and perception of task difficulty (Creswell, 2007).

The selection of this instrument was grounded in both theoretical and empirical considerations. The SOLO-based task battery was chosen because the SOLO Taxonomy provided a well-established framework for assessing the quality and complexity of students' thinking, ranging from simple recall to abstract reasoning (Biggs & Tang, 2011). Previous studies had demonstrated that SOLO-based assessment tasks effectively identify different levels of students' cognitive development and critical thinking skills across various educational context (Biggs & Collis, 1982; Irhasyuarna et al, 2022). The SOLO scoring rubric was employed to ensure consistency and transparency in classifying students' responses according to taxonomy levels. In addition, classroom observation and semi-structured interviews were incorporated to provide complementary qualitative evidence of students' reasoning processes and learning behaviours. The use of multiple instruments is recommended in mix method research because it strengthens the credibility of findings through data triangulation (Creswell, 2007; Creswell & Plano, 2018). Therefore, the selected instruments are considered appropriate for this study as the enable a comprehensive examination of students' critical thinking skills from both quantitative and qualitative perspectives.

2.3 DATA COLLECTION AND ANALYSIS

Data are collected from multiple sources to ensure triangulation ensuring validity and depth (Creswell & Plano Clark, 2018). (1) Performance tasks: students complete a set of written tasks specifically designed to target different cognitive level based on SOLO taxonomy. (2) Classroom observation: the researcher uses a structured observation protocol to capture real-time evidence of reasoning and questioning (Miles & Saldana (2014). (3) Copies of students' written work (4) Semi-structured interviews with the purpose to reflect in answering on written tasks.

Quantitative analysis begins by scoring student responses against a SOLO-based rubric levels 1–5 mapped to numerical scores (J. Biggs, n.d. (1982). The scores were summarized through descriptive statistics which are frequency, mean, and percentage that using Microsoft Excel for data organization and visualization. Qualitative data (observation notes, interview transcripts, and teacher reflections) are analyzed thematically by using NVivo software. The triangulation integrates quantitative scores and qualitative themes to find students' critical thinking development and to explain why certain SOLO levels dominate.

Students' responses were evaluated using SOLO taxonomy-based scoring rubric adapted from Biggs & Collins (1982) and Biggs & Tang (2011). Each task was designed to represent a specific SOLO level and was scored according to the complexity of the students' responses. A score of I indicated a Unistructural response, where students identified a single relevant idea; a score of 2 represented a Multi-structural response, where students identified several relevant ideas without connecting them; a score of 3 indicated a Rational response, where students integrated and related multiple ideas coherently; and score of 4 represented an Extended abstract response, where students generalized and applied their understanding to new context. The total score for each student was calculated by summing the scores across the four tasks and dividing by the number of tasks to obtain an average score. The average score was then used to determine the students dominant SOLO level. This scoring procedure was consistent with previous study that have applied SOLO Taxonomy to assess the quality and complexity of student's thinking and learning outcomes (Biggs & Collis, 1982; Biggs & Tangs, 2011; Irhasyuarna et al, 2022).

III FINDINGS AND DISCUSSION

3.1 FINDINGS

The study aimed to present the findings regarding students' critical thinking skills in English language teaching based on SOLO Taxonomy. The first task measured the students' ability to identify one relevant idea from a simple text. Students read a brief passage and answer a single factual question. The cognitive demand was very basic with no interpretation, explanation and connection between ideas. This task aligned with the Uni-structural level of SOLO taxonomy because students only focused on one point. For the second task was task B that the students identified several relevant details from a descriptive paragraph. The questions asked them to list characteristics of the animal and where it lived. On this task, the students answered multiple ideas, but they were not yet expected to connect the details to each other. This task aligned with the multi-structural level of SOLO where students could recall several pieces of information but did not integrate them into understanding. Meanwhile, on the third task, this task increased students' cognitive complexity by asking about similarities and differences between two things. Here, students must compare and logically connect ideas that demonstrate relational thinking, which directly shows the Relational level of SOLO taxonomy.

Furthermore, on the fourth task, this was the highest task that required students to apply knowledge to a new context and generate ideas. Students must create a written plan on proposing activities for a school "Market Day" programme. The students must answer the questions that consist of "What students should do?", "Why these activities matter?", and "How to encourage participation", from these questions, students needed to create new ideas, provide information and demonstrate reasoning. This task aligned with the extended abstract level of SOLO taxonomy where the students generalize, apply concepts creatively and show high-order thinking. The results of all students' tasks and their level of SOLO taxonomy were displayed below;

Table 2. SOLO-based tasks at the students' level

No.	Student ID	Task A score	Task B score	Task C score	Task D score	Total Score	Average	SOLO Level

1.	Student 1	1	2	3	4	10	2.5	Relational
2.	Student 2	1	2	3	4	10	2.5	Relational
3.	Student 3	1	2	3	4	10	2.5	Relational
4.	Student 4	1	2	3	3	9	2.25	Multi-structural
5.	Student 5	1	2	3	3	9	2.25	Multi-structural
6.	Student 6	1	2	3	3	9	2.25	Multi-structural
7.	Student 7	1	2	3	3	9	2.25	Multi-structural
8.	Student 8	1	2	3	3	9	2.25	Multi-structural
9.	Student 9	0	2	3	3	8	2	Multi-structural
10.	Student 10	1	2	3	3	9	2.25	Multi-structural
11.	Student 11	1	2	3	3	9	2.25	Multi-structural
12.	Student 12	1	2	3	3	9	2.25	Multi-structural
13.	Student 13	1	2	3	3	9	2.25	Multi-structural
14.	Student 14	1	2	3	3	9	2.25	Multi-structural
15.	Student 15	1	2	3	3	9	2.25	Multi-structural
16.	Student 16	1	2	3	3	9	2.25	Multi-structural
17.	Student 17	1	2	3	3	9	2.25	Multi-structural
18.	Student 18	1	2	3	3	9	2.25	Multi-structural
19.	Student 19	1	2	3	3	9	2.25	Multi-structural
20.	Student 20	1	2	3	3	9	2.25	Multi-structural
21.	Student 21	1	2	3	3	9	2.25	Multi-structural
22.	Student 22	1	2	3	4	10	2.5	Relational
23.	Student 23	1	2	3	4	10	2.5	Relational
24.	Student 24	1	2	3	4	10	2.5	Relational
25.	Student 25	1	2	3	4	10	2.5	Relational
26.	Student 26	1	2	3	4	10	2.5	Relational
27.	Student 27	1	2	4	4	11	2.75	Relational
28.	Student 28	1	2	3	4	10	2.5	Relational
29.	Student 29	1	2	3	4	10	2.5	Relational
30.	Student 30	1	2	4	4	11	2.75	Relational

A total of 30 students participated in the assessment; their performance was divided into two categories, as displayed in Table 2 below;

Table 3. The Average of Students' Scores based on SOLO Level: adapted from the SOLO Taxonomy framework presented by Biggs & Collis (1982) and Biggs & Tangs (2011)

Average Score Range	SOLO Level	Number of Students	Percentage of 30	Status
2.5 - 2.75	Relational	12	40%	HOTS
2.0 – 2.25	Multi-Structural	18	60%	LOTS
	Total	30	100%	

Based on the table above, there were 18 students, with 60 % achieving the multi-structural level. It meant that the majority of students were able to identify and mention several relevant ideas, but were not yet able to connect and integrate the ideas. In this result, the critical thinking was present but still developing. Meanwhile, for 12 students reached the Relational level with 40 %. These students could explain the relationship between ideas and connect the concepts. They were able to apply and relate different pieces of information across the tasks. Furthermore, the Relational level showed high-order thinking with represented by 12 students, and the multi-structural level showed low-order thinking with represented by 18 students. It meant that most students were still developing their ability to integrate and connect ideas, but most of the group was already showing strong critical thinking skills.

This result was related to classroom observation that most students participated actively in the learning process. The researcher noted that several students demonstrated Relational level thinking and supported the finding that 40 % of the students were able to integrate more ideas coherently. The English teacher used guiding questions and collaborative activities, although most students were still developing the ability to connect and extend their ideas. To complete the data analyses, the researcher chose three random students for semi-structured interviews to know about how the students' critical thinking was integrated with the written tasks below;

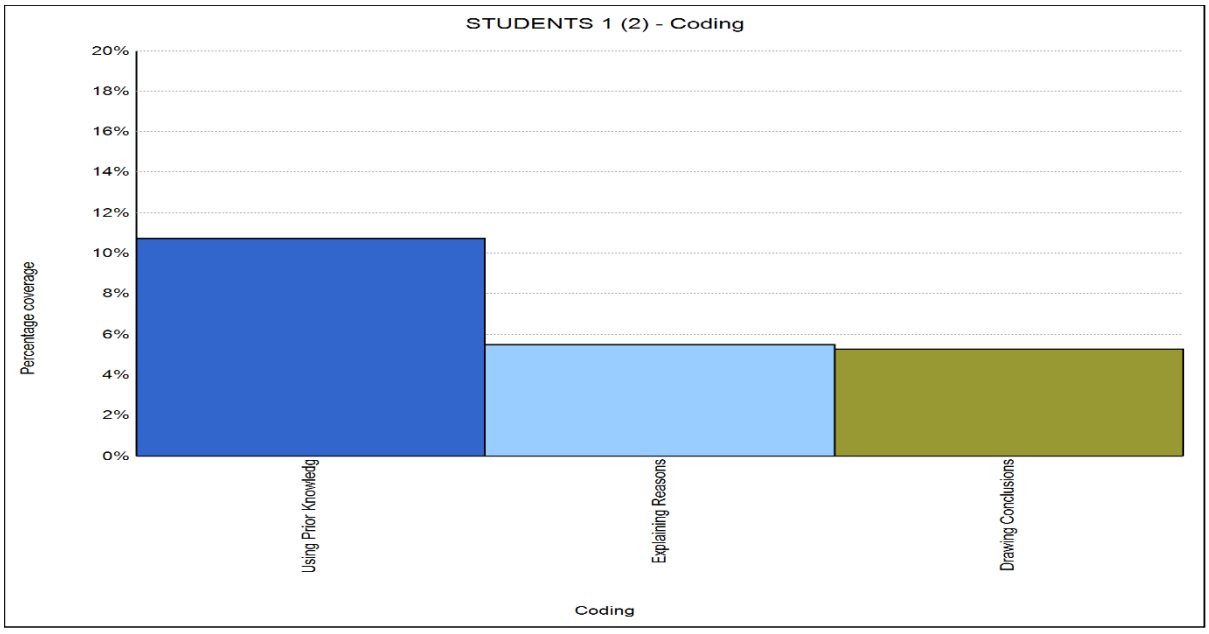

Figure 1. Bar Chart of Student 1

Based on the bar chart by NVivo visualization above that the result showed the percentage of coverage of Student 1 was approximately 10.7 % for "Using prior knowledge", it demonstrated that Student 1 applied pre-existing knowledge. Meanwhile, the code of "explaining reason" and "Drawing conclusion" was approximately 5.2% - 5.5%. Both were strong indicators for higher-order thinking skill (HOTS) as the central in achieving the relational-based SOLO level.

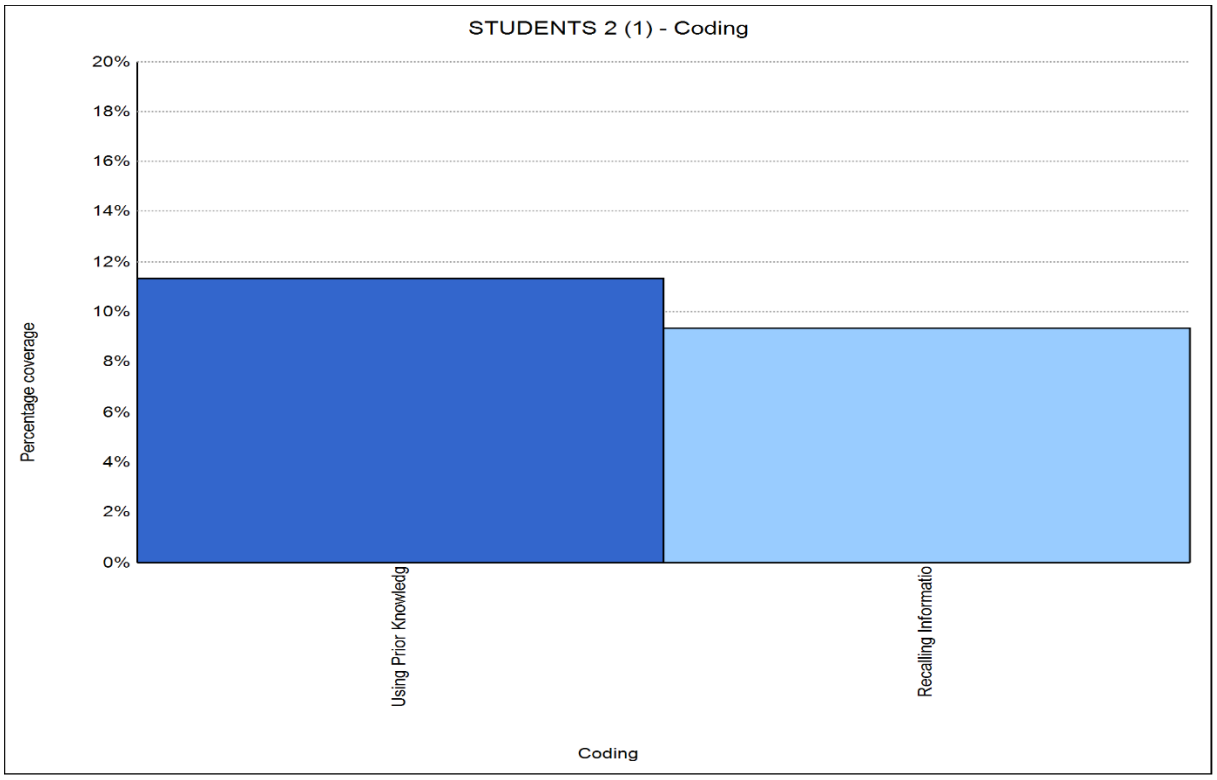

Figure 2. Bar chart of Student 2

In contrast, Student 2 could be categorized at the multi-structural level, because Student 2 was dominantly coded in "Using prior knowledge" with 11.3% and "Recalling information" with 9.3%. The student 2 lacked in the critical step of connecting and drawing a conclusion, which was relating quality of the higher Relational level.

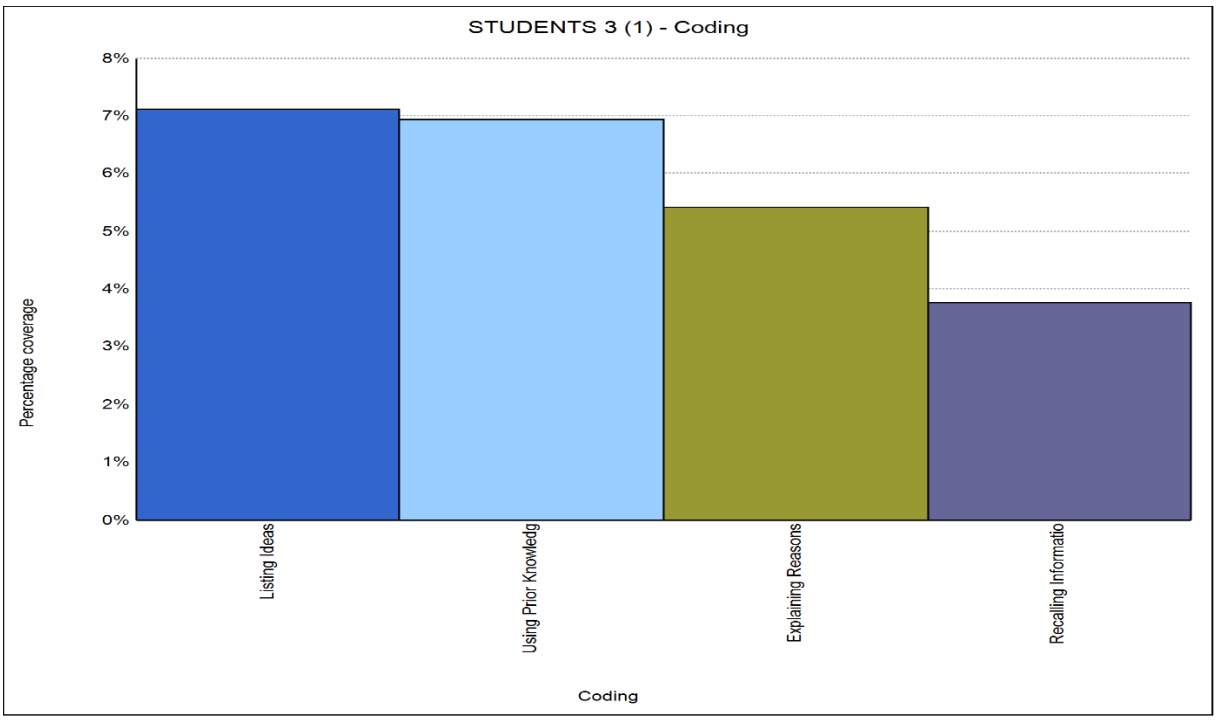

Figure 3. Bar chart of student 3

Based on the bar chart above, Student 3 has achieved Relational level with the coverage of "Listing of ideas" around 7.12%, "Using prior knowledge" 6.9%, "Explaining reason" 5.4%, and "Recalling information" 3.8%. The presence of the Explaining Reasons code (5.4%) is the determining factor that differentiates it from the multi-structural level because Student 3 was able to add the

justification needed to reach the Relational level, even though his thinking process started from gathering facts.

3.2 DISCUSSION

The finding of this study above showed that most students in SDIT Rabbi Radhiyya 02 at fifth grade still struggle to reach higher cognitive levels, often mastering only Lower-Order Thinking Skills (LOTS). It could be seen from the quantitative results that have been summarized in Table 2. It was revealed that the majority of students reached 60% or 18 students included in the multi-structural level, while a significant minority 40%, or 12 students reached the Relational level. However, the achievement of 40% in the Relational level is a clear indication of Higher-Order Thinking Skills (HOTS). Furthermore, the qualitative analysis through case studies provides critical validation of these quantitative scores, explaining why students were categorized at specific SOLO levels, such as Student 2, who scored at the multi-structural level. The bar chart for Student 2 showed that it was almost entirely covered by Using Prior Knowledge, with 11.3% and Recalling Information, 9.3%. In contrast, the students at the Relational level, which demands the ability to integrate ideas and connect concepts, displayed clear evidence of analytical processing. For example, Student 1 who showed their cognitive activity dominated by Using Prior Knowledge 10.7%, which is the basis for the analysis, but crucially supported by codes for Explaining Reasons 5.5% and Drawing Conclusions 5.2%. These two codes for justification and synthesis are strong indicators of HOTS. Similarly, Student 3, also at the Relational level, demonstrated a process starting with Listing Ideas 7.1 % and Using Prior Knowledge 6.9% but was decisively differentiated from the multi-structural group by the presence of Explaining Reasons 5.4%. It is aligned with the theory of J. Biggs & Tang, (2011) that in Relational level the students use two or more pieces of information each directly related to an integrated understanding of the information in the stem.

In summary, the triangulation of quantitative scores and qualitative thematic coding successfully explains the critical thinking development observed. While the majority of students require continued support to consistently move beyond listing ideas, the significant 40% achievement in the Relational level was evidenced by their ability to explain and conclude, suggesting that the ELT approach implemented under the Curriculum Merdeka is effective in cultivating the critical thinking dimension required for the national Graduate Profile. The observed active participation and use of guiding questions in the classroom further support the potential for sustained growth toward higher-order thinking.

IV CONCLUSION

In conclusion, this descriptive mixed-methods study successfully analysed the level of students' Critical Thinking Skills in English Language Teaching (ELT) using the SOLO Taxonomy. The findings showed that the majority on English students with 60% (18 students) and the majority of the students were concluded that based on the findings of table and figure above which there were 60% of 18 students were in the multi-structural level (LOTS), they could explain and identify some of the relevant ideas, but they could not connect and integrate the ideas into new situations.

However, 40% of the 12 students succeeded in reaching the high-order thinking skill; they were at the Relational level. These students could explain the connection between ideas, connect concepts, and integrate various information in a written task, for the Relational level was represented by Student 1 and Student 2 in a semi-structured interview. They tended to “Explaining reasons” and “Drawing Conclusion”. In this study, “Explaining Reasons” refers to students’ ability to justify their answer by providing logical explanations, supporting evidence, or cause-and-effect relationship. “Drawing Conclusions” refers to students’ ability to synthesize information from multiple ideas and arrive at a coherent inference or judgment.

In the multi-structural level, it was represented by Teacher 2, that dominated by “Use prior knowledge” and “Recalling information”. “Use prior knowledge” refers to the activation of previously learned facts, experiences, or concepts when responding to a task. Meanwhile, “Recalling information” refers to the retrieval of explicit information from memory without further analyses or interpretation, but lacked the important steps of connecting and drawing conclusions. The achievement of 40% at the Relational level showed that the ELT approach implemented in the Independent Curriculum is effective in fostering the critical thinking dimensions required for the national Graduate Profile. However, this study has limitations due to the small sample size (one class contains 30 students) from one school. Therefore, it is recommended to conduct the same studies in broader populations and school contexts to

increase the generalizability of the results and design pedagogical interventions oriented towards developing the highest critical thinking skills, namely the Extended Abstract level (creating, theorizing, and generalizing concepts).

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