



EFL Learners' Cognition Process: A Case Study of Two ASD Learners with Different IQ Levels

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Introduction

Autism spectrum disorder (ASD) involves a complex disorder in the behavioral and cognitive domains. Behavioral disorders cover ASD learners' social interaction, difficulty in communication, restricted interest, repetitive behavior, and other areas of life (American Psychological Association (APA), 2013; Chang et al., 2020). Cognitive domain involves cognition process, comprehension, and delay language (Belkadi, 2006; Bickham, 2015; Chawarska et al., 2007; Evans, 2013; Hudry et al., 2010; Lanter et al., 2012).

Research revealed that the correlations between students with autism spectrum disorder and reading comprehension are still inconclusive in terms of their cognition process. Their reading comprehension patterns are still confusing because some experts still have different arguments from different studies (Cain et al., 2004; Chang et al., 2020; Duff & Clarke, 2011; Joseph et al., 2002). Two different arguments related to cognition process of ASD learners were echoed by Nation, Clarke and Williams (2006) and Spector and Cavanaugh (2015). The first argument claims that ASD learners with the average level intelligence have difficulties in reading comprehension processes but Spector and Cavanaugh (2015) believed that students with ASD have powerful abilities in the same field. Those two controversies invite researchers' interest to scrutinize learners with ASD cognition process during reading and think aloud to unveil those controversies.

Previous studies concerning reading comprehension of ASD learners have been widely examined such as those dealing with word meanings, vocabulary, cognitive process, academic reading comprehension, and social function (Chiang & Lin, 2007a; 2007b; Fauziyah et al., 2019; Randi et al., 2010; Ricketts, Jones, Happe, & Charman, 2018; Speirs et al., 2014). However, most of these studies did not address the aforementioned controversies. Only the study under the work of Fauziyah et al., (2019) has tried to examine the ASD comprehension process under the field of Mathematics, which fundamentally differs from second language learning. To date, this study endeavors to seek ASD learners' cognition process under the umbrella of the L2 context.



Literature Review

ASD Learners' Cognitive Process and Reading Literacy

Reading literacy and cognitive process are two essential elements for ASD students to promote their reading skills because both of them can support learners' cognitive development, English skills, fluency, vocabulary, and grammar (Bruner, 1985; Dynia et al., 2014; Lanter et al., 2012). They are also considered as an indication of learners' PISA levels (PISA / OECD, 2015) when it is connected to the PISA reading test. Studies ASD's cognition process have been widely conducted in many different areas such as Mathematics, L2 and psychology (Keat & Khaidzir, 2011; Randi et al., 2010; Woolley, 2016). First, Chiang & Lin (2007a), for example, conducted article reviews in the field of reading comprehension for ASD learners. Their study focused on academic reading and word understanding from various articles published in Scopus indexed journals. The review results revealed that peer tutoring seemed to be an effective strategy in teaching reading comprehension for students with autism in general education settings but they neglected the vital roles of the comprehension process.

Similarly, Randi et al., (2010) investigated ASD student's cognitive skills using academic reading texts. The texts focused on gaining meaning, reading, and decoding skills. The result showed ASD student's cognitive processes was not optimally elaborated on since the focus of the study relied on the decoding aspect. Third, in the field of Mathematics, Fauziyah et al. (2019) scrutinized ASD learners' cognitive process of Mathematical thinking. From the study, they found that ASD learners' cognitive process involved five linear stages, namely sentence interpretation, message recall, conceptual knowledge, plan design, and implementation.(Anderson, 2005; Frankel et al., 2016). However, the literature has been relatively sparse regarding ASD cognitive processes under the L2 domain since Mathematics, and L2 domains need different cognition processes and skills. Therefore, this study aimed at investigating ASD learners' cognition process in L2 reading activities using PISA reading literacy.

Methods

Design

The study was case study research with two ASD students as participants. This case study research allows for an in-depth analysis of participants in naturalistic settings with detailed reflection of phenomena that occur. Naturalistic observations, interviews, and artefacts were examined to draw the participant's cognition process during the research process (Disney & Geng, 2017). In this study, two ASD students' cognitive processes were carefully observed while comprehending a reading literacy test. The cognitive processes were analyzed to construct theories during the interaction with a PISA reading comprehension test.

Participants in the Study

The subjects were two ASD students from two different senior high schools in Gresik city, Indonesia. The first subject (YI) was a male ASD learner from a private senior high school, and the second subject HF was also a male ASD learner from a vocational high school. Both of them were part of the ASD research and development center owned by a private university. The researcher and the co-authors have been teaching English to the two ASD learners for more than a year. The two subjects had different IQ levels. YI had 105 and HF had 72 IQ scores from the university test before they took the ASD program. From the IQ test, the first subject liked to repeat words while he was reading. He had a good arithmetic ability and had won many mathematics competitions. The second subject was a student of a private

vocational school majoring in computer science. He had good computer abilities and had many achievements in web design. The result of his IQ test showed that he could not focus when hearing voices.

Data Collection and Analysis Procedures

The key instruments of this research were observations and interviews conducted by the author and two co-authors. Data was collected through on-site observations and interviews while the two research subjects were doing their reading tests. A set of reading comprehension texts and tests from PISA reading literacy (PISA / OECD, 2015) and task-based interviews with the interactive think-aloud method were simultaneously applied as the supporting instruments (Fauziyah et al., 2019). In this case, the researcher and team acted as a planner, collector, analyzer, interpreter, and reporter of the research results. Thus, the researcher had to be objective, responsive, and neutral in interpreting the data. The data were taken from a task-based interview while the ASD learners were doing their reading tests using PISA reading texts (PISA / OECD, 2015). The subjects were required to read every single word aloud. The think-aloud method has a strong theoretical background with valid data sources about what is in the mind of the subjects during language-based activities (Fauziyah et al., 2019). Thematic analysis was interpreted by the researcher and team to avoid bias. Participants' reading and think-aloud excerpts, answer sheet, video transcript, and subject behavior were thematically interpreted to draw their cognitive processes involving understanding problems, planning, implementing a plan, and rechecking the data.

Findings

This study aimed at investigating ASD learners' cognition processes in L2 reading activities using PISA reading literacy. The following results elaborated two different subjects of ASD learners. The results were illustrated below. The results were drawn from addressing the three comprehension questions from the PISA reading text entitled 'bird migration' containing 100 words. The text told how the group of birds migrates. In addressing the three comprehension tests were: (1) migrated birds' evolution, (2) evolution causes, (3) route of migration. Y's answers for the three items were correct. Meanwhile, only one item was correctly (Item 3) answered by the second subject HF. During the reading aloud, interviews and observations activities, both subjects could read the text fluently, but the second subject tended to read more slowly.

While the two subjects were reading and answering the PISA tests, the researcher gave some interview questions asking about the process of finding the correct answers from the three questions. The interview questions were why and how the subjects chose their answers and what made their answers true. The following excerpts elaborate on the responses of both subjects. The excerpts from the first to the third questions are found in the next section:

Cognition process of the first PISA question

- R : ("Why and how did you choose the answer of the first item?", "Can you explain the process of it?").
- Y : ("First, I read the question very carefully. Then, I tried to remember it well. Afterwards, I brought the question into the passage to find the possible answer through adventure reading by noticing the relevant clues and synonymous words. Finally, when I was sure with the answer from the clues, then I stop reading the passage. So, In this case, I did not read the whole passage).
- H : (I read every word in the passage one by one, and when I found a difficult word, I stop reading and I tried to get the meaning of the word from the dictionary. Then, I wrote each definition in the Indonesian language above the unfamiliar word I found. Afterwards, I read the question, and I did the same

translating strategy in the question to comprehend the word meaning and the content of it. After it is understood, I went on to the passage, read every word of the passage to find the possible answer to the question).

The above excerpts illustrated different cognition processes performed by the two study participants in addressing the first item of the PISA reading test. The first subject Y answered correctly, but the other subject H did not. Participant Y's cognition processes were shorter than the second participant H. The three cycles of participant Y's cognition processes were comprehending questions, finding a clue and answering the questions. Meanwhile, the six cycles of participant H's cognition processes were read, translate every word in the texts, questions, translate the unfamiliar words, write the definition, comprehend the content of the passage, understand the question, and discover a possible answer.

Cognition process of the second PISA question

- R : (“Why and how did you choose the answer of the first item?”, “Can you explain the process of it?”)
- Y : (I read the question, and I found that the text does not mention the consequence that it could possibly happen if a volunteer miscalculates the bird migration. I hypothesize this based on the word sighting of the tagged bird, color rings and flags. In addition, I could see the volunteer was afraid of making a mistake. From the previous signs, I concluded that there were some inaccurate counts that affected the bird species migration).
- H : (I read the word several times and tried to see the unfamiliar words using my digital dictionary. Afterwards, I concluded the answer based on my translation and opinion).

The above excerpts illustrated different cognition processes performed by the two different study participants in addressing the second question item of the PISA reading test. The first subject Y answered correctly. Both of them are requested to answer ‘the influential factor which affected volunteer’s failure in identifying bird migration’ First, Y could address this inferential question type through the same steps by making connecting between the phrases of ‘sighting of tagged bird, color rings and flag’ and ‘situation’. Finally, he came up with a correct conclusion of ‘species’ as his correct answer. Conversely, the second subject H responded incorrectly since he could not identify the question of “how” correctly. Therefore, his answer was incorrect since he wrote his response with the word ‘because’ to refer to his reason.

Cognition process of the third PISA question

- R : (“Why and how did you choose the answer of the first item?”, “Can you explain the process of it?”)
- Y : (I read and remembered the question and then associated it with the appropriate content of the passage, underlined the vocabulary and also circled the corresponding image and answered the question).
- H : (I saw the picture, I read the question that I have been Translated afterwards I matched it with the main content and I can answer it).

The above excerpts illustrated different cognition processes performed by the two study participants in addressing the first question item of the PISA reading test. Both of them answered the question correctly since they could identify the textual clues from the text well.

Discussion

The aim of this study was to investigate the cognition process of the two EFL ASD learners who have different IQ levels through the PISA Reading comprehension test. The discussion emphasizes on the cycles and processes of cognition as well as the roles of IQ level on learners' cognition processes. The results revealed that the subject with a higher IQ level had shorter cycles of cognition processes than the subject with a lower IQ level. The cognition process of the subject with high IQ level involved comprehending the question, finding a clue and answering the question. Differently, the cognition processes of the second subject who had a lower IQ level proceeded his cognition through reading and translating every word in texts and questions, translating the unfamiliar words, writing the definition, comprehending the content of the passage, understanding the question, and finding a possible answer.

The first discussion elaborated on the connection between ASD learners' IQ level and their cognition processes in reading comprehension. Previous study results revealed that higher levels of IQ resulted in the more effective cognition process in reading comprehension tests and problem-solving issues (Checa & Fernández-Berrocal, 2015; Demetriou & Spanoudis, 2017; García-Madruga et al., 2013; Kafadar et al., 2015; Russo, 2004; Scholz & Scheer, 2020; Tiu et al., 2003). The second discussion is closely related to the use of keyword and essential clues in the cognition process. The study showed that ASD learners who have high IQ levels applied contextual and textual clues in their cognition process. Regarding this, previous studies also echoed similar results. They also asserted that the use of contextual clues geared to learners' comprehension (Fasih et al., 2018; Kong, 2015; Ma, 2014; Roberts & Kelly, 1985; Song, 2019). In the previous studies, they only look at the comprehension outcomes such as reading comprehension scores, and ability. This study promoted the cognition process under the ASD subjects with different IQ levels.

In addition, regarding the use of the word by word translation strategies. The results revealed that these strategies bring two consequences, namely positive and negative roles of word translation in the comprehension process. The positive roles of word translation was reported to be one of the powerful strategies to comprehend reading comprehension (Al-Musawi, 2014; Calis & Dikilitas, 2012). They asserted that this strategy could promote learners' reading comprehension and understanding of word meaning. Conversely, this study provided different negative evidence in comprehending a passage where word translation could not scaffold ASD learners in answering PISA reading tests since the learner could not follow the three stages of cognition processes, namely understanding key word and meaning, comprehending the question, and finding the correct answer. In the L2 context, ASD learners' cognition processes were only three stages and shorter than those in the Mathematics field which involved five stages.

Several studies indicated that vocabulary mastery and English performance positively influence the comprehension process (Haebig & Sterling, 2017; Melling & Swinson, 2016). Since ASD learners' vocabulary mastery and their English performance were not identified in this study, it is too early to propose that ASD learners' cognition processes were merely influenced by their IQ level.

Conclusion

The study has explored ASD learners' cognition processes in the PISA reading comprehension test. The results revealed that an ASD learner who had high IQ levels proceeded his cognition by bringing the important clues from the question and skimming strategies to answer the PISA reading test. Conversely, word by word text and question translations were applied by the ASD learner who had low IQ levels.

Teaching reading comprehension to ASD learners with different IQ levels had to be carefully formulated. Since the ASD learners who have high IQ levels could comprehend reading processes using essential clues from the test, teaching reading could be normally implemented by emphasizing the essential clues from the text to foster their reading comprehension. Conversely, teaching reading

comprehension for the ASD learners who have low IQ levels using word for word translation strategies should be cautiously scaffolded to promote their textual comprehension because the low IQ level is found to be one of the potential barriers in the cognition process. Those two recommendations unveiled how the cognition process in L2 was applied in PISA reading comprehension. It is also recommended for ASD teachers to facilitate their ASD learners to meaningful vocabulary development using the learners' mother tongue and familiarity to L2 cognition stages can foster their cognitive skills and reading comprehension abilities.

Since the two vital variables of learners' vocabulary and English background were not involved in the study, the conclusion could not comprehensively address the role of IQ level towards ASD learners' cognition processes. Therefore, it is recommended that future researchers scrutinize whether learners' vocabulary and English performances influence ASD learners' cognition processes.

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