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THE UTILIZATION OF MIND MAPS TO ASSIST A STUDENT WITH AUTISM SPECTRUM DISORDER

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Abstract

Everybody has the right to get an education; a student with autism spectrum disorder (ASD) is no exception. The researcher had an ASD student in his Curriculum and Material Development class. It turned out that the student struggled to comprehend and memorize the materials. Therefore, the researcher decided to use mind maps to assist him. Action research was conducted to investigate the challenges and benefits of using mind maps. The research employed three gathering techniques namely, observations, content analysis, and an interview. The findings suggest that the ASD student often forgot how to make an effective mind map and he found it difficult to make a mind map without getting any help. Hence, repetitions and assistance from lecturers in making mind maps are of utmost importance. With the help of the lecturers, the ASD student found it easier to comprehend and memorize the materials.

Keywords
Mind Maps, Autism Spectrum Disorder, Comprehension, Assistance

1. Introduction

Everybody has the right to get an education, including people who suffer from Autism Spectrum Disorders (hereafter ASD). The US Government has issued the Individuals with Disabilities Education Act (IDEA) which was originated from the Education for All Handicapped Children Act signed by President Gerald Ford on November 29, 1975. (Gumora, 2014). In Indonesia, the National Education System in Article 5 (2) mandates that "*Citizens who have physical, emotional, mental, intellectual, and/or social have the right to get special education*". (Law of Republic Indonesia, 2003). Hashim, H.U., Yunus, M. Md, & Norman, H, (2021) stated that "*autism spectrum disorder (ASD) or widely known in short as Autism, is a spectrum disorder identified by various characteristics, which usually includes perceptual, cognitive, and social differences"* (Hashim et al, 2021 p.24). The cognitive differences usually also influenced the ASD student's ability to comprehend the lessons.

1.1. Problem Identification

Despite having a guarantee from the government to get an education, it is not easy for students with ASD to follow the lessons. Accardo & Finnegan (2019) stated that students with ASD struggle with reading comprehension.

In the even semester 2020-2021, the researcher had a student with ASD enrolled in his Curriculum and Material Development Class. In this class, the students were required to analyze the environment, discover needs, set goals and objectives, and then design a curriculum and develop materials (Nation & Macalister, 2010). It was quite a complicated process for the student with ASD. He struggled to comprehend and memorize the materials, especially those presented in the form of long-written text.

Accardo & Finnegan (2019) posited that teachers can help students with ASD by providing visual support. In this research, the author tried to assist the ASD student by using mind maps which is one type of visual support.

1.2. Gap Identification

Many studies have confirmed the benefits of using mind maps, Rizqiya (2013) researched the use of mind mapping in teaching reading comprehension. The participants of her study were 34 students in a senior high school in Bandung. She observed how the students learned narrative

texts through mind maps. In addition, she collected the students' mind maps and distributed questionnaires for both the teacher and the students. Based on her analysis, it could be concluded that the use of mind maps succeeded in attracting the students' attention and improving students' reading comprehension. She found out that 80% of the students could comprehend the texts well.

Similarly, Saori (2020), in his article "The Use of Mind Map to Teach Reading Comprehension" reported that the use of the mind mapping technique has a significant effect on students' reading comprehension. In his research, he conducted a quasi-experimental design. He took two classes of first-year students of Nabi' Nubu' Islamic Senior High School as the participants of his study, one class (the experimental group) was taught using the mind-mapping technique, while the other (the control group) learned using conventional learning technique. The researcher gave pre-test and post-test for both groups. The result showed that the experimental group's mean score (71.76) was higher than the control group (60.62).

In line with that, Alomari (2019) in his research entitled "Using Mind Mapping Technique to Improve Reading Comprehension Ability of Fourth Grade Arabic Language Students in Jordan" found out that the use of electronic mind-mapping was very beneficial in improving students' reading comprehension. In his quasi-experimental research design, he divided the students into two groups, the control group consisting of 34 students was taught using a traditional method, while the experimental group was taught using electronic mind maps. The two groups took pre-test and post-test. The statistical analysis revealed that because of electronic mind maps, the experimental group was significantly better at reading comprehension than the control group.

While there have been a lot of studies discussing the advantages of using mind maps, the studies that address specifically the utilization of mind maps to assist ASD students are rare.

1.3. Research Objective

The research objective is to answer the following questions:

- What are the challenges of using mind maps to assist a student with ASD?
- What are the benefits of using mind maps to assist a student with ASD?

2. Literature Review

Teaching ASD students is quite challenging, especially when they must deal with comprehending text. Many studies have shown that ASD students generally suffer in the areas of comprehension.

2.1. ASD Student's Difficulties in Text Comprehension

Knight V.F, Wood, C.L, Spooner, F, Browder, D.M., & O'Brien, C.P. (2015) stated that "*Comprehension in core content areas is a challenging skill for many students and can be especially difficult for students with autism spectrum disorder*" (Knight et al, 2015 p.86)
Wahlberg & Magliano (2004) revealed that ASD students found it difficult to apply background knowledge and make global and abstract connections. Moreover, O'Connor & Klein (2004) found out that ASD students faced difficulties in integrating information, understanding, resolving anaphoric reference, and monitoring comprehension.

Tárraga-Mínguez R, Gómez-Marí I, & Sanz-Cervera P., (2021) surmised that "*Children with autism spectrum disorder (ASD) often have comorbid learning difficulties in reading comprehension, an essential skill in accessing any area of the curriculum*". (Tarraga et al, 2021 p.1). They argued that comprehending text requires the ability to decode the graphemes and extract linguistic meanings. The ASD student often found these tasks problematic.

Braun & Hughes (2020) observed that ASD students often got lower scores on comprehension assessments compared to their classmates. This is probably due to their lack of ability to use various knowledge and skills simultaneously. This makes teaching ASD students quite demanding. "Emerging research demonstrates that students with ASD showdifficulties in reading, specifically reading comprehension" (Braun & Hughes, 2020 p. 288).

Students with ASD generally score lower in reading comprehension performance compared to their peers. (Baixauli I, Rosello B, Berenguer C, Téllez de Meneses M, **&** Miranda A, 2021). They emphasize that it is necessary to analyze the cause and find the solution to this problem because comprehension is a crucial skill not only for academic achievement but also for their social and occupational success in life.

2.2. Interventions for Assisting ASD Students' Comprehension

Knight et al (2015) believed that interventions enable ASD students to compensate for their lack of comprehension skills. According to them, interventions such as peer tutoring, cooperative learning groups, and procedural facilitation are effective to enhance ASD students' comprehension skills. Moreover, Knight, et al (2015) promoted the use of Computer Assisted Instruction to aid ASD students' Comprehension since previous studies confirmed the effectiveness of this type of intervention to improve ASD students' comprehension skills (Knight, McKissick, & Saunders,

2013; Yamamoto & Miya, 1999, and Heimann, Nelson, Tjus, & Gilberg, 1995, in Knight et al, 2015)

Furthermore, Tarraga-Minguez, et al (2021) studied 25 scientific articles regarding interventions to improve reading comprehension published in peer review journals published between 2000 to 2019. Based on their reviews, interventions like cooperative learning and the use of graphic organizers were advantageous for ASD students.

Braun & Hughes (2020) agreed that interventions gave positive results to build ASD students' comprehension skills. Hence, they strongly support the use of strategies such as class-wide peer tutoring, cooperative learning, anaphoric cueing, and self-directed strategies. However, they reminded educators to pay attention to students' unique and individual needs. Educators need to adapt and monitor the suitability of the strategies to ensure the development of ASD students' comprehension skills.

According to Baixuli et al (2021), appropriate and effective interventions are important to overcome the problem of ASD students' low performance in reading comprehension. They suggested that the educators map the areas of vulnerability and factors affecting the ASD students' comprehensions to plan the interventions accordingly.

2.2.1. The Use of Mind Maps to Assist ASD Student's Comprehension

Tony Buzan (2005) the inventor of mind maps surmises that mind maps that use words, images, numbers, and logic are powerful to unleash the potential of the brain. Farrand, P.A., Hussain, F., **&** Hennesy, E. (2002) posits that mind mapping is "*a study technique in which information from a variety of sources is converted into a diagrammatic representation of the important keywords associated with a study topic."* (Farrand et al, 2002 p. 426). Hashim et al (2021) agreed that one of the best ways to teach students with ASD is by using images and pictures.

In short, mind mapping is a visual thinking tool that helps the student organize and remember information. The visual aspects of the mind map probably help the ASD student to remember the lessons better. Dewan (2015) argues that "*Pictures are not only more effortless to recognize and process than words, but also easier to recall*" (Dewan, 2015 p.2). Therefore, combining graphics with text will increase the learners' memory since a picture is worth a thousand words. Moreover, when we add colors to the mind map, it will increase the viewers' attentional level. This, in turn, will increase the opportunity for the stimuli to be delivered and stored in our permanent memory storage. (Dzulkifli & Mustafar, 2013).

3. Methodology

In this study, the researcher employed Classroom Action Research (CAR), which is "*an approach to educational research that is commonly used by educational practitioners and professionals to examine, and ultimately improve, their pedagogy and practice*." (Spencer, C.J., Suzanne, P., Julie, T., & Morgan, J. 2020, p.8). As mentioned before, there was an ASD student enrolled in the Curriculum and Material Development Class in the odd semester 2020-2021. Based on the information given by the lecturers who taught the ASD student in the previous semesters, the ASD students found a lot of difficulties in comprehending the lessons. Hence, he needed special attention and guidance from the lecturers to ensure that he was not left behind.

Coping with the problems of comprehension, the researcher decided to do an intervention because according to Knight et al (2015)," *Although comprehension is a weakness for many students with ASD, studies reviewed demonstrate appropriate interventions can aide comprehension skills."* (Knight et al, 2015, p.87). The intervention was in the form of using mind maps to assist the ASD student. The Action Research of using mind maps was conducted in the Curriculum Development Class and followed the cycles suggested by Spencer et al (2020). They said," *Action research is iterative: plans are created, implemented, revised, then implemented, lending itself to an ongoing process of reflection and revision*." (Spencer et al, 2020 p.9)

3.1. Research Design

First, in the planning stage, the researcher observed how the ASD student followed the lesson in the CMD class. In addition, the researcher (who was also the lecturer of CMD) would see the results of the ASD student's written assignment. Next, in the implementation stage, the researcher assigned the ASD student to create mind maps based on some units in the CMD module. Then, the researcher would analyze the mind maps made by the student. After analyzing the mind maps, the researcher gave feedback and asked the students to revise the mind maps based on the lecturer's input. The revised maps were evaluated, and the cycles were repeated. Finally, the student would be interviewed by one of the researcher's colleagues.

3.2. Participant and Research Duration

The participant of this research was an ASD student joining the Curriculum and Material Development class in the even semester 2020/2021. The research lasted for only one semester.

3.3. Data Collection

The tools for collecting the data were:

- Observations: The first three meetings of the CMD class were used by the researcher to observe how the ASD students followed the lessons and comprehended the materials.
- Student's mind maps: The student was assigned to create mind maps based on some units in the CMD module. The researcher evaluated the mind maps.
- Recorded zoom meetings: The recordings of the student's mind maps presentation was recorded and analyzed.
- An Interview: At the end of the semester, the student was interviewed by one of the researcher's colleagues. The student was asked to reflect on his experience of using mind maps during the semester.

3.4. Data Analysis

The data would be analyzed qualitatively, and the results would be presented in the form of descriptions.

4. Findings and Discussions

From the observation conducted at several meetings at the beginning of the semester, it was evident that the ASD student found it difficult to comprehend the materials. He also complained to the lecturer that he was confused about the content of the lesson, especially when the lesson was presented in the form of long and complicated text.

The researcher then formed a hypothesis that the student will comprehend the lesson better if he makes a mind map. It is predicted that the mind map will serve as an aid for him to better understand the lesson.

Based on the prediction, the researcher assigned the student to create a mind map from one of the chapters in the module. At this stage, the student worked independently without getting any help from anybody. He submitted the mind map and presented the mind map through the zoom meeting.

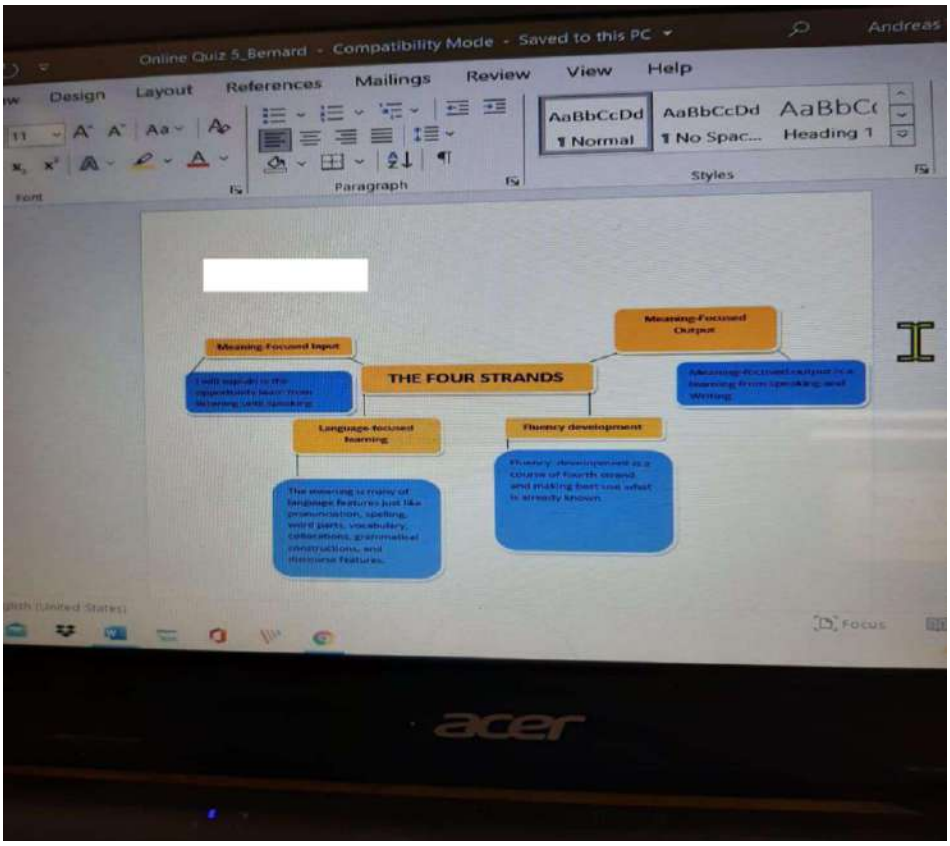

Figure 1: *Mind Map Made by The Student*

(Source: Student's Assignment)

As can be seen, the mind map created independently by the student needs a lot of improvements. First, he did not use keywords, he used sentences even paragraph instead. Second, there were no curved branches, and there were no sub-branches. Moreover, no pictures or images in the mind map.

After analyzing the mind map, the researcher decided to help the student by informing him how to make a good mind map. This was done through a zoom meeting, in which the researcher explained the criteria of a good mind map, played videos about mind maps, and gave examples of mind maps. Then, the researcher assigned the student to make a new mind map.

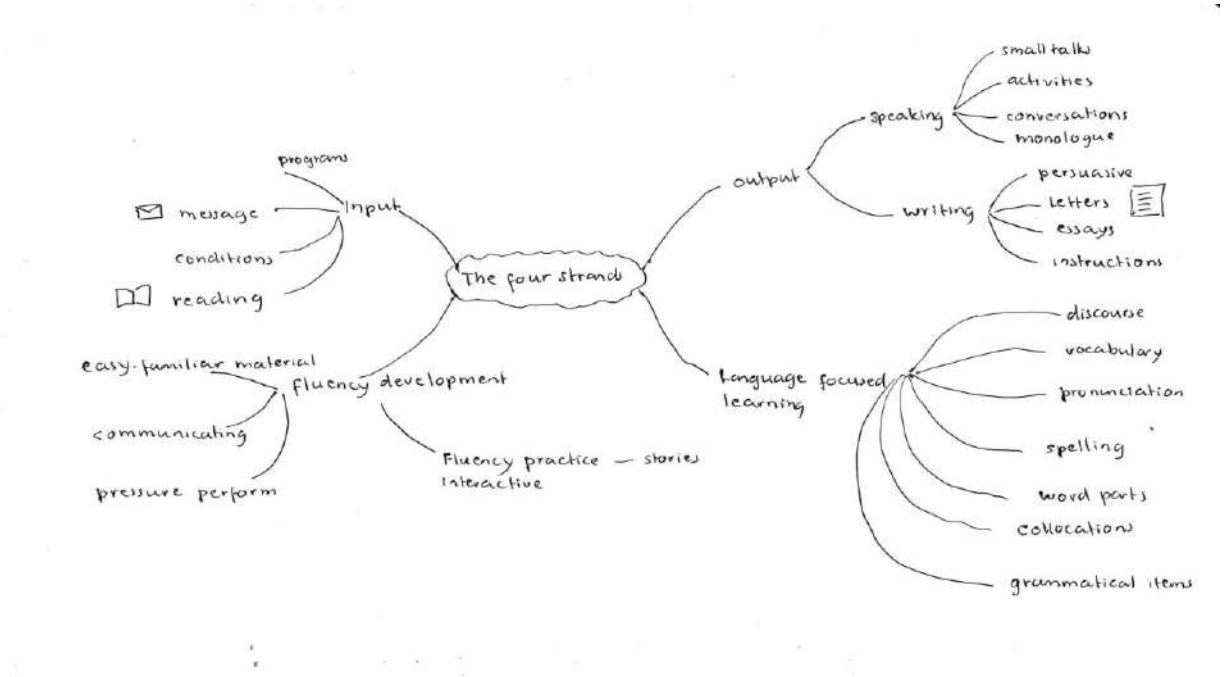

Figure 2: *Revised Mind Map by The Student*

(Source: Student's Assignment)

There were some improvements made by the students. First, he put the idea concept in the middle. Second, he used curved branches. In addition, he made sub-branches radiating from the branches. Third, he used keywords instead of sentences. Noting the progress, the researcher decided to ensure whether the student has understood how to make a good mind map by assigning him to make another mind map. He submitted the mind map and presented the mind map through the zoom meeting.

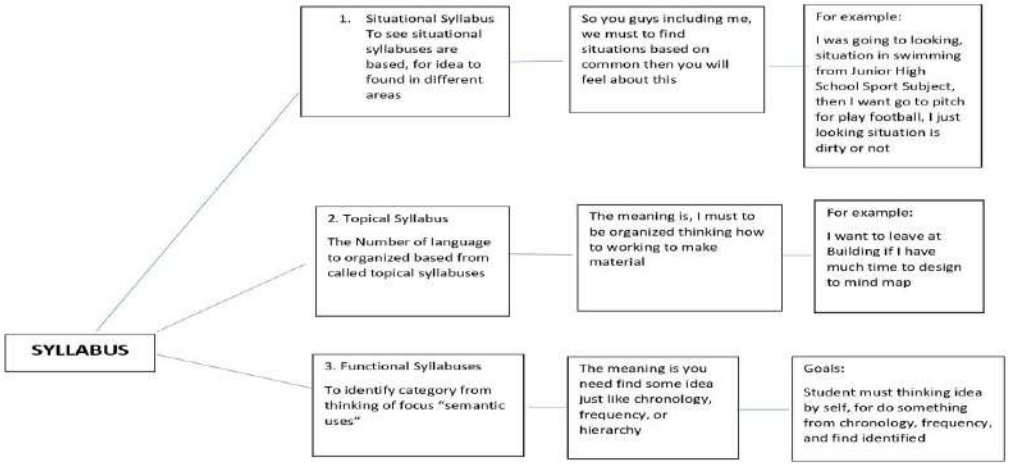

Figure 3: *Another Mind Map Made by The Student*

(Source: Student's assignment)

As shown in figure 3, the student forgot some criteria of how to make a good mind map. First, the concept idea is not at the center of the paper. Second, instead of using keywords, he used sentences even paragraphs. Third, there were no curved branches, and there were no sub-branches. Moreover, no pictures or images in the mind map. He also found it difficult to explain the mind map because the mind map contains too many sentences.

It can be concluded that the student needed reminders in the form of a checklist to help him retain information given by the lecturer. For the ASD student, repetitions are of utmost importance. The checklist can be given in a very simple format as follows:

Table 1: *Checklist Of A Good Mind Map*

Check the one that you have done

No	Criteria	Please give a checkmark
1	The key concept in the middle	
2	Write some important points (headings)	
3	The headings radiate into some subheadings	

4	Use curve branches to connect the key concept with the headings, and headings with the sub-headings	
5	Use color	
6	Use images	
7	Understand the flows of ideas (thoughts)	

(Source: Buzan, 2005)

In addition, the researcher decided to conduct another experiment by giving more assistance to the student. He took one unit of the module and transformed the text into an incomplete mind map. Furthermore, the researcher provided some options for the ASD student.

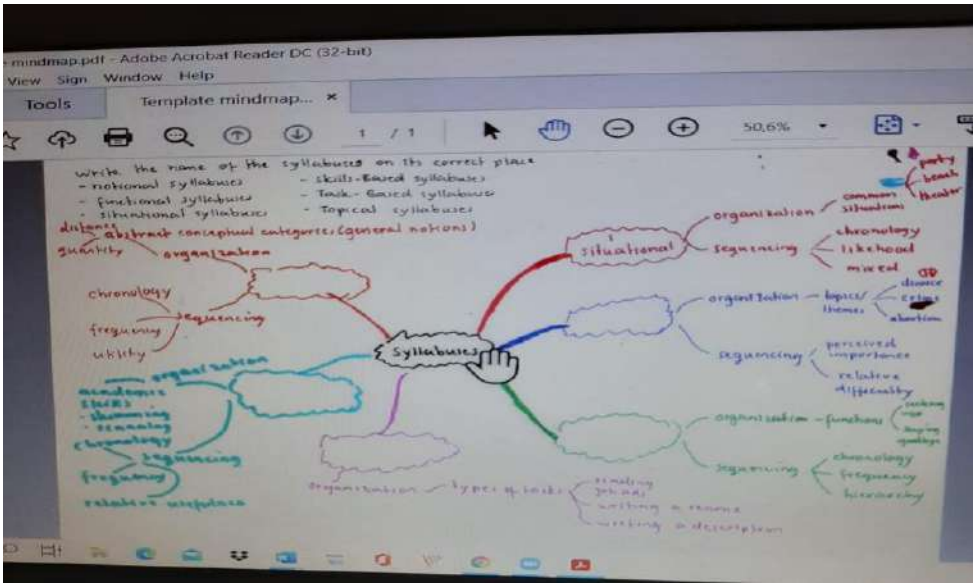

Figure 4: *Incomplete Mind Map Provided by The Researcher*

(Source: self)

Then, the researcher assigned the student to complete the mind map and scheduled a zoom meeting for the student to present his complete mind map. The completed mind map can be seen below.

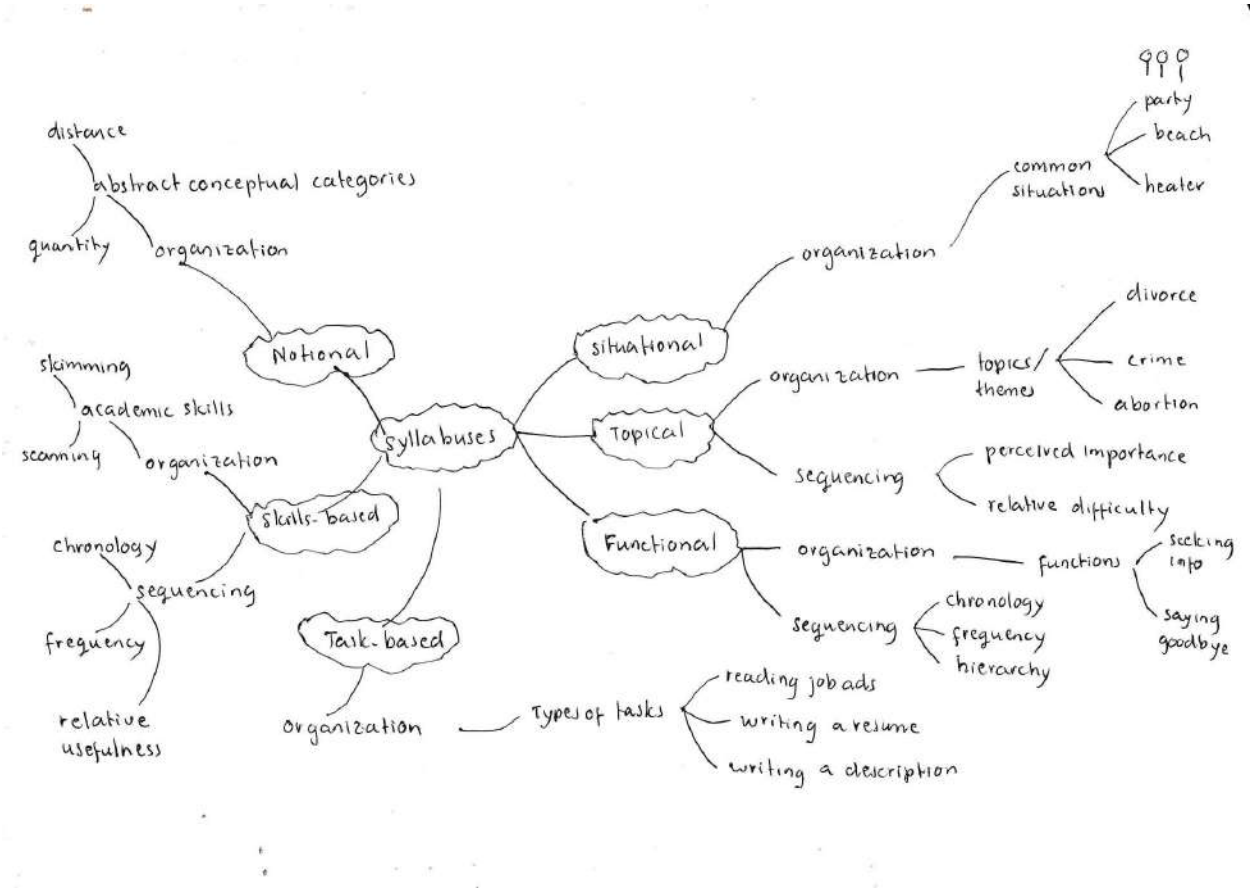

Figure 5: *A Mind Map Completed by The Student*

(Source: Student's Assignment)

The results were quite good, the student was fluent enough in explaining the types of syllabuses. Moreover, when the researcher asked him to explain one type of syllabuses without looking at the mind map, he was able to do it.

At the end of the semester, the ASD student was interviewed by one of the researcher's colleagues. The ASD student admitted that mind maps enabled him to comprehend the materials better.

From the experiment, the researcher found the answer to the research questions.
First, the challenges that the researcher encountered were:

- The ASD student found it difficult to create mind maps independently from a text.
- The student easily forgot how to create a good and effective mind map.

Those challenges could be overcome by providing help for the students such as mind map consultation. This proved to be useful for the student because by doing mind map consultation, he remembered important points to make a mind map. The ASD student needed repetition to acquire

a new habit, including making mind maps. The more he practices, the better he was at making mind maps.

Second, there were a lot of benefits that the students gained by learning using mind maps. They are as follows:

- The student was more motivated to study because a mind map is more interesting than a mere text.
- It was easier for the student to comprehend the lesson because mind maps resembled the work of the brain.
- As the saying goes, tell me that I may forget, teach me that I may understand, involve me and I learn. In this study, the student was actively involved in creating mind maps. He could use images and colors of his own choices to complete the mind map.

At the end of the semester, one of the researcher's colleagues interviewed the students. Here is the script:

Interviewer	:	*What difficulties did you find in making mind maps?*
The student	:	*At first, I did not know how to transform the materials into mind maps. So, I found it difficult to make mind maps without any assistance.*
Interviewer	:	*Did the lecturer help you to overcome the difficulties?*
The student	:	*Yes, he gave me an incomplete mind map, then he asked me to complete the mind maps.*
Interviewer	:	*Did it help you?*
The student	:	*Yes, I could complete and use my creativity to complete the mind map.*
Interviewer	:	*What are the benefits of using mind maps?*
The student	:	*Mind maps helped me to comprehend the materials better and mind maps will help me in the real world to organize and remember information.*

(*Source: Interview with the ASD student.)*

5. Conclusion

A mind map helped the ASD student to organize and remember information. However, the student needed help from lecturers or assistant lecturers. The assistance was given in the form of scaffolding, namely: reminding the student regarding how to make a good mind map. This can be done by providing a checklist. Then, the lecturer provided an incomplete mind map that the ASD student needed to complete. The study shows that a mind map is an effective tool to help ASD students comprehend the materials. This is conformed to Kwok & Lim (2021)

> *There was a saying that, "A picture speaks a thousand words". The use of visual elements did help the learners to engage a much deeper understanding of learning. Interaction that performed through visualization help engage the students to learn better in their learning process (Kwok & Lim, 2021 p.91)*

However, repetitions regarding mind maps and assistance from a lecturer are needed to ensure mind maps' effectiveness.

5.1. Research Limitations

The researcher acknowledges that the present study has the following limitations:

- There was only one ASD student involved in this research. This is because only one ASD student enrolled in the researchers' class. Since there was only one participant, no comparisons and generalizations could be made.
- The duration was very short. The research only lasted for one semester (16 weeks). Hence, the participant could only make a few mind maps. More analysis of mind maps will make the findings and conclusions more reliable and valid.
- All the meetings were conducted online. Several meetings did not run smoothly because of bad signals.
- The ASD student did not take pre-test and post-test.

5.2. Scope of Future Research

Further studies are conducted in a wider and deeper scope:

- It will be better if further studies involve more participants. Two or more participants will enable the researcher to make comparisons regarding the effectiveness of using mind maps.
- If possible, the research is carried out for at least two semesters. Longer time will enable the participants to create more mind maps. Consequently, more analysis can be done.

- Face-to-face interactions will make it easier for the researcher to discuss and assist the student.
- Pre-test and post-test will enable the researcher to gauge the participants' progress.

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