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# THE USAGE OF A-J+3+6 METHOD IN BRAILLE WRITING WITH SLATE AND STYLUS

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***ABSTRACT:*** *The purpose of this study is to compare the effectiveness of Braille writing with slate and stylus the conventional method and the A-J+3+6 method. The authors conducted an experimental study at the cluster primary school for the blind; eighteen blind and visually impaired (BVI) students from Year 2 and Year 3. Ten blind students and eight low vision students were selected as samples. A modified method of braille writing using slate and stylus derived from the abkl method and Mangold method namely A-J+3+6 method was used in this mix-method study. The qualitative data of focus group interview and observations were used to support the quantitative findings. Data analysis showed that method A-J+3+6 (M=76.11 SD=17.81) is more effective in braille writing using slate and stylus rather than the conventional method (M=46.67, SD=24.6) is statistically significant at the 0.05 level (t=2.907, p<0.05). Data also showed that students who used the conventional method tend to do more mirrorerrors than students who used the A-J+3+6 method (t=1.889, p<0.05). Meanwhile, study also found that there is no statistically significant in braille writing with slate and stylus between the visual acuity; low vision students (M=66.88, SD=26.98) mastered the braille writing skills using slate and stylus better thanblind students (M=57.0, SD=25.29) is not statistically significant at the 0.05 level (t=-0.799, p>0.05). Data also showed that there is no statistically significant in mastering the braille writing skills using slateand stylus between the age of onset; students with congenitally blind (M=60.42, SD=27.91) and students with adventitiously blind (M=63.33, SD=23.17) is not statistically significant at the 0.05 level (t=-0.220, p>0.05).*
*Braille Writing; Slate and Stylus; Blind and Visually Impaired*

## INTRODUCTION

Braille is the primary literacy medium for those who are blind. Braille literacy strongly correlates with better reading habits and involvement in post-secondary education (Ryles, 1996). There is also a strong link between braille literacy and employment: A survey of 1,056 individuals with visual impairments of working age found that the daily use of braille had a positive impact on employment, salary, and self-esteem (Bell & Mino, 2013; McCarthy, Rosenblum, Johnson, Dittel & Kearns, 2016). Braille is the foremost tactile reading and writing system and is considered the primary means by which people who are blind can become literate (Napier, 1988; Schroeder, 1989; Stephens, 1989). It is a basic medium of communication and has been an essential component of programs that educate children who are blind. Approaches to teaching beginning braille readers vary; however, a commonality among approaches is that learners need the opportunity to use braille and develop their knowledge of braille contractions (Swenson, 2016). Braille has been called "the key to opportunity" (Schroeder, 1989), "the means of emancipation, the greatest gift to the blind" (Eldridge, 1979). Although blind or visually impaired individuals are able to access print materials by using audio books or listen to a personal reader and can write by dictating to someone, many find that they can access information more quickly and perform tasks that involve reading or writing more efficiently using Braille (Halliday, 2004). Braille is essential for note taking in the workplace and at school, knowing braille makes it possible for blind people to read and write independently (Cheadle, 2007; Ryles, 2000; Swenson,2016).



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Despite the major strides achieved in access technologies such as synthesized speech (for example, screen readers), braille remains an important tool for readers with visual impairments (McCarthy, Rosenblum, Johnson, Dittel & Kearns, 2016). Writing consists of both the process of writing, with all the abstract concepts that entails, as well as the physical act of writing. These two aspects are closely inter- related and are common to all children irrespective of their level of vision. What distinguishes visually impaired children is that they must always use a tool for the physical act of writing. For a blind and visually impaired (BVI) child, braille writing tools play a pivotal role in their early literacy experiences, especially when you consider that a sighted child often begins to write using finger painting, drawing in the sand or on a frosted car window, well before formal education begins (Connell, 2004).

Background: The slate and stylus is the oldest, most portable, and most dependable tool for writing in braille. It has been compared to the sighted person's pen or pencil (Figure 1). Like the pen and pencil, the slate and stylus is inexpensive, portable, and simple to use. It allows a blind person to function independently in any environment (Blake 2003, Cheadle2007, Schroeder, 1989).

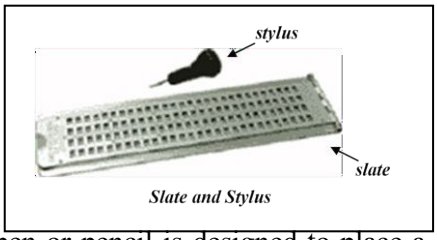


Figure 1: Slate and Stylus

Just as the pen or pencil is designed to place a visible mark on a piece of paper, the slate and stylus is designed to punch (emboss) raised, tactile bumps or dots onto a page. Since braille is a very exact system, the dots in the braille cell must be precisely spaced it would not do to attempt to punch dots free-hand onto a page. In order to hand-braille accurately, there must be a puncher (the stylus) which, when pressed into the paper, will raise a tactile braille dot, and a guide (the slate) which will allow the user to punch the dots into precise positions (Cheadle, 2007).

Unfortunately, use of the slate and stylus is often seen as difficult, writing backward, and unnecessary (Blake, 2003; Cheadle, 2007; Mangold, 1985). Technological advances such as the Perkins Brailler and various electronic braille input devices are seen as appropriate replacements for the slate and stylus. Wittenstein and Pardee (1996) reported that 89% of teachers of BVI students agreed that speech technology should be used as a supplement to braille, not as a replacement. Teaching of the slate and stylus is neglected. Students who do not have access to the popular note-taking devices and who wish to avoid disturbing others in class by using the Perkins Brailler rely heavily on memory, tape recording, or other students' notes (Eldridge, 2005; Halliday, 1999).

For all the same reason for the BVI children learn to use the slate and stylus is as the same reasons that sighted children learn to write with a pencil and pen. Think about it, sighted children have had access to typewriters, tape recorders, and even computers for years and yet, none of these devices has replaced the need for pencil and pen. Denying the blind child the slate and stylus is tantamount to denying the sighted child the pencil (Eldridge, 2005; Allman, & Lewis, 2014).

For sighted readers, progress in technology has obviously not replaced print just the opposite: it has greatly simplified and empowered access to the printed word. Similarly, the use of an intelligent electronic braille tutor can be used to augment instruction by teachers of BVI students and to promote increased levels of braille literacy (McCarthy, Rosenblum, Johnson, Dittel & Kearns, 2016).

The ability to take quick, legible notes with a cheap, simple, portable device is important for both print readers and braille readers (Blake, 2003, Cheadle, 2007 & Schroeder, 1989). A slate does not use batteries or an electric outlet. It can be carried in a pocket. It is cheap to replace and inexpensive

enough that several may be purchased at one time just like pencils or pens. The slate and stylus allows the braille reader to write down information he or she can immediately read and review anywhere, anytime. A student may easily take a slate and stylus with him or her to write classroom notes; take a telephone message; take down names, addresses, and telephone numbers and write out all types of braille labels and lists. Where a pencil can go, a slate and stylus can go (Cheadle, 2007).

The use of slate and stylus among the BVI students in Malaysia are not popular, it's due to the believe of majority of the students and teachers teaching the BVI that writing with slate and stylus is writing backward and it's difficult to mastered compared to braille machine, lack of proper technique and module to teach the use of slate and stylus, and the training programs provided by both teacher training institutes and tertiary institutions were not focused on teaching braille writing with slate and stylus, thus the use of slate and stylus among the BVI students were neglected (Kway, Norani Mohd Salleh, & Rosadah Abdul Majid, 2009).

In the Conventional Method (writing backward), students must learn mirror images of all letters which doubles the alphabet and creates a disparity between the written and read form of each letter (Kalra, Dewey, Stepleton, & Dias, 2009). Besides the conventional method, there were several methods invented to teach braille writing with slate and stylus. In this study, two of the methods namely abkl Method ((Kizuka & Oda, 1989) and Mangold Method (Mangold, 1993) were used and modified by researchers and was named A-J+3+6 Method to teach Braille writing with slate and stylus. The A-J+3+6 Method emphasized on the concept of braille writing with slate and stylus and no mental reversals are required as the dots numbering position begin from right to left instead of left to right as the writing with slate and stylus from right to left.

The target groups in this study were Year 2 and Year 3 BVI students with mono-disability either blind or low vision at the cluster primary school for visually impaired. The overall aim of this study was to compare the effectiveness of braille writing with slate and stylus the conventional method (writing backward) and the A-J+3+6 method. This study focuses on visual acuity, age-of-onset and the spelling errors in braille writing with slate and stylus.

The following research questions were addressed:

a. Is A-J+3+6 Method more effective than Conventional Method in braille writing when using slate and stylus?
b. Is there any different in spelling errors made by students who wrote with A-J+3+6 Method with those who wrote by Conventional Method?
c. Is blind students mastered the braille writing with slate and stylus better than low vision students?
d. Is age-of-onset influence the mastering of braille writing with slate and stylus of the visually impaired students?

## METHOD

Design: An embedded experimental QUAN (qual) mixed-method design was used (Creswell & Plano Clark, 2007). The post-test true experimental design was used to compare the effectiveness of Braille writing with slate and stylus (Creswell, 2008). Quantitative measures were used for answer accuracy, visual equity and age-of-onset in effectiveness of Braille writing with slate and stylus. Meanwhile, qualitative measures of observations and focus group interviews were used to support the quantitative findings.

Participants: Initially, 24 students were chosen to participate in the study (10 Year 2 and 14 Year 3). However, 6 students were dropped by the researchers because they had multiple disabilities. Thus, a total of 18 visually impaired students participated in the study. Of the 18, 10 were blind students and 8 low vision students. None of the students who participated had additional identified disabilities.

Instruments: A modified A-J+3+6 Method was introduced in the treatment group while the control group was using the Conventional Method taught by two teachers selected among four shortlisted teachers based on their qualification and years of teaching the BVI students before randomize assigned to control and treatment groups respectively. Each selected teacher has more than 15 years of experience teaching children with visual impairment. Beside the guided focus group interview questions, an observation checklist designed by the researchers was used along th

study to gather qualitative data to support the quantitative findings.

Methods of Analysis: Quantitative analysis to test the hypotheses was undertaken using SPSS for Windows. To determine an error-analysis pattern, a procedure described by Argyropoulos and Martos (2006) was followed. These researchers analyzed spelling errors of 16 students who read Braille in Greece using two broad categories: phonological-type errors and nonphonological-type errors. The content analysis process described by Bogdan and Biklen (1992) was followed in analyzed the focus group interviews.

Procedure*:* After the approval to conduct research was obtained from the Ministry of Education Malaysia, the researchers begun to identified Year 2 and Year 3 students from the cluster primary school for visually impaired and shortlisted them. Only the students with mono disability (blind or low vision) were taken in to participate in the study. The students were first blocked accordingly into Year 2 and Year 3 before randomize assigned to control and treatment groups. Each group consist of 9 students respectively. Subsequently, a series of training conducted to train one of the two randomize assigned teachers to use the A-J+3+6 Method in teaching Braille writing with slate and stylus. After a two-weeks long teaching the groups using Conventional Method and A-J+3+6 Method in Braille writing with slate and stylus by the teachers, a dictation test was administered by researchers. According to Tindal and Marston (1990) this is the most frequently used assessment in the classroom. Focus group interviews were conducted immediately after the test by researchers and observations were carried out throughout the study.

## RESULTS

Study shows that A-J+3+6 Method ($M$=76.11, $SD$=17.81, $n$=9) was statistically significant than the Conventional Method ($M$=46.67, $SD$=24.62, $n$=9), $t(16)$=-2.907, $p$<0.05 level. Thus, the null hypothesis, indicating that there is no difference between Conventional Method and A-J+3+6 Method in mastering the Braille writing with slate and stylus, was rejected (Table 1).

*Table 1-T-test for Comparing Methods in Braille Writing with Slate and Stylus.*

| Method | n | Mean | Standard Deviation | df | t | Sig. |
|---|---|---|---|---|---|---|
| **Convention** | 9 | 46.67 | 24.62 | 16 | -2.907 | 0.005 |
| **A-J+3+6** | 9 | 76.11 | 17.81 | | | |

Significant at p<0.05 level

To determine an error-analysis pattern, the procedure described by Argyropoulos and Martos (2006) was followed. Figure 2 shows the errors made by students while writing braille with slate and stylus. These errors pattern may group into three main components namely Pre-writing, Braille Cell Quality, and Substitution of Letters. Subs components in each component will be analyse. There were two subs components found in the Pre-writing component; loading and moving-up paper into the slate. While in Braille Cell Quality component consists of three subs components; braille dots not clear, paper torn, and no spacing between words. There were three subs components established in the Substitution of Letters component; that is wrong formation of Braille dots, letter omission, and mirror error.

In Pre-writing component, there were three students (16.7%) not neatly loading and moving-up the braille paper into the slate respectively. While in Braille Cell Quality component, there were seven visually impaired students (38.9%) with Braille dots not clear errors, eight students (44.4%) had paper torn while writing braille with slate and stylus, and five students (27.8%) made error in without leaving a space between words. In the Substitution of Letters component, there were 13 students (72.2%) with wrong formation error, nine students or 50% of them with both letter omission and mirror error respectively.

The finding also shows that students using the Conventional Method in braille writing with slate and stylus tend to do more mirror error compared to those students using

the A-J+3+6 Method. Data in Table 2 shows that students in the control group using Conventional Method ($M$=4.33, $SD$=3.32, $n$=9) did more mirror errors compared to the students in the experiment group using A-J+3+6 Method ($M$=1.89, $SD$=2.02, $n$=9), $t(16)$=1.886, $p$<0.05 level. Thus, the null hypothesis, indicating that there is no difference in mirror errors between Conventional Method and A-J+3+6 Method in braille writing with slate and stylus was rejected.

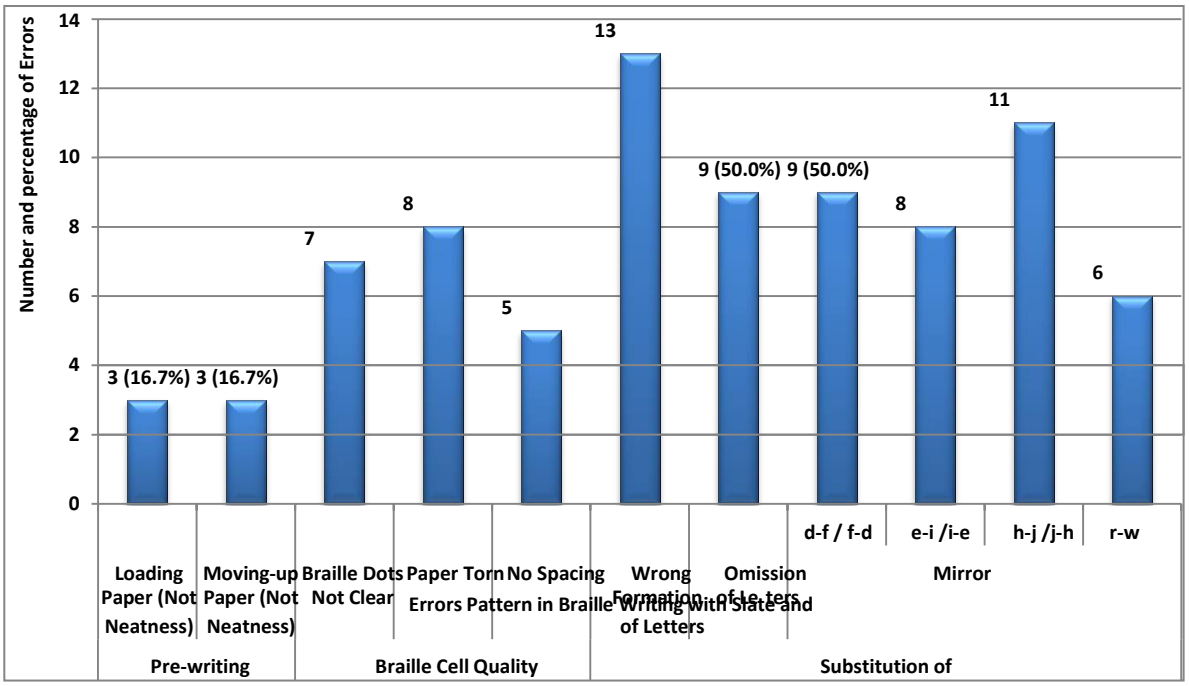


*Figure 2-Percentage of Errors Pattern in Braille Writing with Slate and Stylus.*

*Table 2-T-test for Mirror Errors between Conventional Method and A-J+3+6 Method in Braille Writing with Slate and Stylus.*

| Method | n | Mean | Standard Deviation | df | t | Sig. |
|---|---|---|---|---|---|---|
| **Convention** | 9 | 4.33 | 3.32 | 16 | 1.886 | 0.039 |
| **A-J+3+6** | 9 | 1.89 | 2.02 | | | |

Significant at p<0.05 level

In terms of visual acuity, data shows that there is no statistically significant between the low vision and blind students in mastering the braille writing skills with slate and stylus. Table 3 shows that low vision students ($M$=66.88, $SD$=26.98, $n$=8) mastered the braille writing skills using *slate and stylus* better than blind students ($M$=57.0, $SD$=25.29, $n$=10), $t(16)$=0.799, $p$<0.05 level.

*Table 3-T-test for Comparing Visual Acuity in Braille Writing with Slate and Stylus.*

| Visual Acuity | n | Mean | Standard Deviation | df | t | Sig. |
|---|---|---|---|---|---|---|
| Blind | 10 | 57.0 | 25.29 | 16 | -0.799 | 0.218 |
| Low Vision | 8 | 66.9 | 26.98 | | | |

Significant at p<0.05 level

Data in Figure 3 supported the finding that the low vision students outperformed the blind students in mastering the braille writing skills with slate and stylus. Data shows that, there was

a low vision student scored full marks (100%) and another student scored 95% marks while only one blind student scored 90% marks as the highest in the group. Data also shows that the lowest mark obtained by the low vision student was 30% marks compared to the blind student only scored 20% marks. This discovered that the low vision students had mastered the braille writing skills with slate and stylus better than the blind students although their medium of reading and writing are large print and pencil.

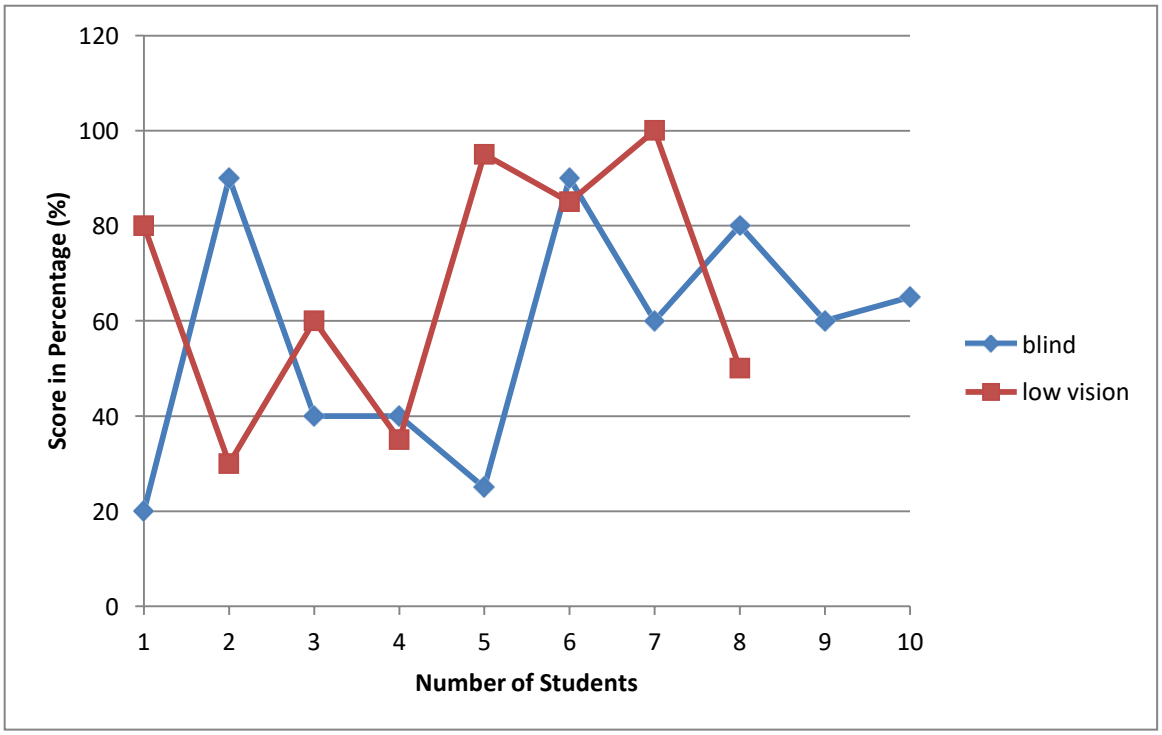


*Figure 3-Performance of Low Vision and Blind Students in Mastering the Braille Writing with Slate and Stylus.*

Observations data indicated that all low vision students used their residual vision in helping them mastered the braille writing skills with slate and stylus. Although some of them may first time been exposed to writing in braille, their residual vision play a vital role in assisting them to master the skills in writing Braille with slate and stylus. Data from the focus group interviews with low vision students from both control and experiment groups revealed that they used their residual vision in assisting them to load and move-up paper into the slate, find the indented braille cells in the slate, and help them to place the stylus into the correct position in the slate while writing braille with slate and stylus. Their comments included, "I used my vision to assist me in loading the paper to align it with the slate... I also used my vision to read braille dots before I start writing..."; "I read braille with my eyes... then I memorized the braille dots... then I reversed the braille dots before I write into the slate..."; "I read with my eyes... I used my vision to help me in moving-up the paper... I also used my vision to locate where did I last stop writing in the slate..."; "I used my vision to assist me loading the paper and writing with slate and stylus..."

Study also revealed that there is no statistically significant difference in the age-of-onset. Table 4 indicated that there is no significant difference between the congenitally blind ($M$=60.42, $SD$=27.91, $n$=12) and adventitiously blind ($M$=63.33, $SD$=23.16, $n$=6) in mastering the braille writing skills with slate and stylus. A $t$-score of -0.220 was obtained, which was not significant at the $p$>0.05 level. Thus, the null hypothesis indicating that there is no difference in mastering braille writing with slate and stylus between congenitally blind and adventitiously blind was accepted.

*Table 4- T-test for Comparing Age-of-Onset in Braille Writing with Slate and Stylus.*

| Age-of-Onset | n | Mean | Standard Deviation | df | t | Sig. |
|---|---|---|---|---|---|---|
| **Congenitally blind** | 12 | 60.42 | 27.91 | 16 | -0.22 | 0.414 |
| **Adventitiously blind** | 6 | 63.33 | 23.16 | | | |

Significant at $p<0.05$ level

**Discussion**

The purpose of this study was to compare Conventional Method and A-J+3+6 Method in writing braille with slate and stylus. The results from the hypotheses testing indicate that the A-J+3+6 Method is more effective than Conventional Method in writing braille with slate and stylus. The result supported previous findings by Blake (2003); Schroeder (2005) that writing braille with slate and stylus is not writing backward. By remembering the dots position or "dot calling" (Bourgeanlt, 1969) in A-J+3+6 Method enabled students to write braille with slate and stylus without doing mental reversal of the braille code before writing. In this method, the researchers stress on concepts of writing braille with braille machine and slate and stylus. In this study, because most of the blind students had learnt writing with braille machine, thus they have no difficulty in writing with slate and stylus. They just need to switch the dots 1, 2 and 3 instead from left to right when writing from right with slate and stylus.

The very same reason applied to the mirror errors made by most of the students in the control group. In the Conventional Method, students need to mentally reversed the braille codes before writing with slate and stylus (Kalra, et al., 2009). Thus, students who used the Conventional Method tend to do more mirror errors than students who used the A-J+3+6 Method.

The study also indicated that low vision students had outperformed the blind students in writing braille with slate and stylus. Thus, there is no reason why should stop low vision students from learning braille. According to Lusk & Corn (2006) visually impaired students should learn read and write using print and Braille regardless of their visual acuity. Rex (1989) states that by depriving students who are visually handicapped and clearly read at less than functional speed of the right to braille rather than print is to deny them equal access to life. The emphasis on use of vision has resulted in a decrease in number of low vision students reading and writing braille (Mullen, 1990). Schroeder (1989) states that alternatives to braille such as low vision devices often limit the amount of reading material that can be viewed at one time to one word or even to one or two letters of a single world, thereby significantly reducing reading speed and comprehension.

The finding revealed that there is no difference of age-of-onset in mastering braille writing with slate and stylus. The range of the age-of-onset in this study is from two months old till age of five. This is contradicting to Heward (2006) and Gargiolu (2008) statements that people who are adventitiously blind retain a visual memory of things they formerly saw. This memory can be helpful in a child's education. The result supported Schlaegel (1953) finding, he claimed that a person does not retain visual imagery if blindness occur before age three, when blindness comes between ages three and five, then visual imagery could remain in some individuals, and when lose of sight happens after age five, then visual imagery is retained. According to Lowenfeld (1955), useful visual imagery was not retained if blindness occurred before age of five.

Limitation: The study had several limitations. Since the study was designed to compare the two methods in Braille writing with slate and stylus of Year 2 and Year 3 students in cluster primary school for the visually impaired, caution should be exercised in applying the results to the larger population of students. The sample was small ($n$=18), which further limits the ability to generalize the findings. Millar (1997) suggested that advances in knowledge may be obtained with a relatively small number of participants if the research purpose is clarified, the empirical methods and instruments are reliable and valid, the hypotheses and the outcome measures of the variables are related to the purpose, and the results are carefully interpreted and discussed. An additional

limitation is the fact that the sample was collected from only one school. Future research should focus on more schools and larger samples.

**Conclusion**

This study has compared the braille writing with slate and stylus between Conventional Method and A-J+3+6 Method. The results indicated that the A-J+3+6 Method is more effective in braille writing using slate and stylus rather than the conventional method. The A-J+3+6 Method emphasized on the concept of braille writing with slate and stylus and no mental reversals are required as the dots numbering position or "dot calling" (Bourgeanlt, 1969) begin from right to left instead of left to right as the writing with slate and stylus from right to left. This enabled students to write braille with slate and stylus without doing mental reversal of the Braille code before writing. Since most of the blind students had learnt writing with braille machine, thus they have no difficulty in writing with slate and stylus. They just need to switch the dots 1, 2 and 3 instead from left to right when writing from right with slate and stylus.

Data also showed that students who used the conventional method tend to do more mirror errors than students who used A-J+3+6 method. Meanwhile, study also found that there is no statistically significant between the visual acuity in braille writing with slate and stylus; low vision students mastered the braille writing skills using slate and stylus better than blind students. Qualitative data from observations indicated that all low vision students used their residual vision in helping them while writing braille with slate and stylus. Besides that, data from the focus group interviews with low vision students from both control and experiment groups revealed that they used their residual vision to assist them in writing braille with slate and stylus. Data also showed that there is no statistically significant in mastering the braille writing skills using slate and stylus between students with congenitally blind and students with adventitiously blind.

With such little data, it is impossible to draw firm conclusions. However, we believe that there is a need to promote the A-J+3+6 Method in writing braille with slate and stylus. We thought that it is essential to teach braille writing with slate and stylus to both blind and low vision students regardless of their visual acuity. Although a small sample may not give strong evidence to make generalization, it may provide some evidence about the A-J+3+6 Method as the better method in writing braille with slate and stylus apart from the conventional method.

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