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The Impact of Bionic Reading on the Reading Motivation and Self-Efficacy of Students with Learning Disabilities

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Abstract — This research identified the impact of bionic reading technology on the reading motivation and self-efficacy of the learners with disabilities in School A and School B for the school year 2022-2023. The study is a quasi-experimental and descriptive research that involved 110 learners with learning disabilities from two localities. The adapted questionnaire used was the Motivations for Reading Questionnaire (MRQ). Using frequency count, percentage, mean, mean rating, and t-test, the impact of bionic reading on reading motivation and self-efficacy was identified. The domains for motivations for reading mostly received High to Very High ratings in terms of the domain. Results revealed a significant difference between the before and after intervention of the experimental group in terms of reading motivation concerning the learners' self-efficacy. The control group, on the other hand, did not have a significant difference. The findings present the effectiveness of bionic reading in the reading motivation and self-efficacy of learners with learning disabilities. The level of self-efficacy of the students with learning disabilities in the control group and experimental group in the pre-intervention period was in unsure/neutral verbal description (3.26-4.0). The control group retained the unsure/neutral verbal rating while the experimental group went up to moderately certain I can do or average after the bionic reading intervention. Results revealed that the use of bionic reading technology presented significant changes in the post-test results of the experimental group. With that, the use of bionic reading technology and other educational tools and sites can be considered to help motivate the learners. An intervention plan was created based on the study's findings and is recommended for implementation.

Keywords — Special Education, Quasi-Experimental Method, Bionic Reading, Reading Motivation, Reading Self-Efficacy

I. Introduction

Reading is an essential skill that is critical for success in academic and professional life. However, students with learning disabilities often struggle with reading, leading to poor academic outcomes, low self-esteem, and reduced learning motivation. Despite the availability of various reading interventions, students with learning disabilities continue to be left behind their peers in reading skills, motivation, and self-efficacy.

Students with learning disabilities encounter several significant challenges in developing reading skills. As indicated by the National Center for Learning Disabilities (NCLD), approximately 2.4 million students in the United States have a learning disability, and 80% of students with learning disabilities have deficits in reading skills (NCLD, 2021). These deficits can lead to academic difficulties, low self-esteem, and reduced learning motivation. Research has shown that students with learning disabilities have lower reading motivation and self-efficacy levels than their peers without disabilities (García-Madruga et al., 2018; Schunk, 1991).

Reading disabilities

Moreover, students with learning disabilities face more challenges in reading. Reading skills are one of the main areas where students with learning disabilities fall behind academically. According to Chitiyo (2021), significant learning problems are frequently linked to reading difficulties. Students perform roughly in reading grades as they get grades below standard when the learning disability transpires with behavioral problems. Students with learning disabilities with reading skill deficiencies experience various issues in other areas, such as poor performance in other subjects, lower academic grades, behavioral problems, and inattention. Even worse, researchers found out that poor reading performance is linked to several lifelong issues, such as high school dropout, juvenile criminality, and a high likelihood of experiencing the juvenile justice system. Reading problems result in lifelong problems.

Domestic concerns in reading transpire when the parents or people at home fail to recognize the problems of the learner with a disability. According to Yang et al. (2018), self-efficacy, home literacy environment, and extrinsic motivation are related to reading achievement. Some parents face frustration in teaching their children to read without considering their learning struggles. With that, the need for intervention for reading for students with disabilities is explored by the researchers.

Bionic reading

Bionic reading is an innovative approach to improving reading outcomes for individuals with learning disabilities. Bionic reading involves the use of assistive technologies to help individuals with learning disabilities to read and comprehend text. These technologies include text-to-speech software, optical character recognition, and speech recognition software, which can enhance reading skills, motivation, and self-efficacy for students with learning disabilities.

Therefore, this study seeks to investigate the impact of bionic reading on the reading motivation and self-efficacy of students with learning disabilities in Schools A and B. The findings of this study will provide insights into the potential benefits of bionic reading technology for students with learning disabilities and inform the development of effective interventions to improve reading outcomes for this population.

Literature Review

Reading Interventions

The study by Lee and Chen (2016) examined the impact of text-to-speech technology on reading comprehension, reading motivation, and self-efficacy among students with learning disabilities. The findings revealed that the use of text-to-speech technology improved students' reading comprehension and had a positive effect on their reading motivation and self-efficacy. The present study is different in terms of the variables, participants, the bionic technology to be used, which is the artificial fixation points, and the locale of the study.

Yueh et al. (2019) examined the effectiveness of a reading intervention program that incorporated bionic reading technology for students with learning disabilities. The findings revealed that the use of bionic reading technology improved students' reading comprehension, reading motivation, and self-efficacy and that the program was effective in improving students' overall reading abilities. The present study is unique because of the subject matter, the bionic reading technology used, which is the artificial fixation points, and the participants.

Bionic reading

Murray et al. (2019) examined the impact of bionic reading technology on reading attitudes, self-efficacy, and reading comprehension of students with reading difficulties. The results showed that students who used bionic reading technology had more positive attitudes toward reading, greater self-efficacy, and better reading comprehension than students who did not use it. The present study is different in terms of the participants, the bionic technology to be used, which is the artificial fixation points, and the locale of the study. Lefever et al. (2019) explored the use of eye-tracking technology in understanding the nature of reading, specifically bionic reading. The authors argue that eye-tracking provides valuable insights into how readers process text when using bionic reading tools. Sánchez and Castañeda (2021) discussed the potential benefits of bionic reading for readers of all abilities. The authors argue that bionic reading tools can enhance reading comprehension, increase reading motivation, and improve self-efficacy for all learners.

In summary, these studies and literature will provide a theoretical framework for understanding the nature and benefits of bionic reading as an approach to reading instruction. This can help justify the study’s need and provide a rationale for its focus on bionic reading. They offer empirical evidence on the impact of bionic reading on reading motivation and self-efficacy. This can help support the hypothesis that bionic reading can positively affect these outcomes for students with learning disabilities. They highlight the potential benefits of bionic reading for readers of all abilities, including those with dyslexia. This can help broaden the study's scope beyond just students with learning disabilities and provide insights into how bionic reading might be helpful in other contexts. They provide practical examples and guidance on implementing bionic reading in the classroom or other settings. This can help to inform the proposed action plan

for the study and provide insights into best practices for using bionic reading tools to support reading instruction.

The research anchored on different technologies in reading and improving reading. However, limited literature is seen to explore bionic reading among students with learning disabilities. Numerous reading interventions were utilized, but bionic reading was not used for individuals with special needs. This is the gap that the paper intends to address since the paper involves the employment of bionic reading among learners with special needs.

II. Methodology

Descriptive, quasi-experimental, and comparative research designs were used to carry out the study. A descriptive research design was employed in the study to determine and describe the characteristics of the respondents, considering age, gender, and grade level. A descriptive study design aims to systematically gather data to describe phenomena, circumstances, or populations. More particularly, it helps provide answers to the research problem's details, including what, when, where, and how inquiries as opposed to why (Voxco, 2021).

The study involves two schools with a total of 110 participants with special needs. These included elementary, middle school, and high school students aged 6-18 years old. The localities were not disclosed to maintain the anonymity of learners since they could be identified if the names of the schools were addressed.

This study involved the systems approach using the input, throughput, and output processes. The study commenced with identifying participants who meet the criteria for having a learning disability, specifically in the area of reading. The participants were assigned to either an experimental group using bionic reading technology or a control group using traditional reading materials. The first step in conducting the research study involving students was to obtain permission from the school district and consent from the student's parents or legal guardians. It is important to secure this permission and consent to guarantee that the study is conducted ethically and to protect the rights and privacy of the students involved. Upon approval, the participants were then requested to answer the questionnaire that gathered demographic information, which included age, gender, and grade level. The participants were then assessed using the Motivation to Read Questionnaire-Revised (MRQ-R) and reading self-efficacy questionnaires to measure their reading motivation and self-efficacy in reading. These instruments were adapted since they have already been used in various studies about reading.

These two processes were done both before and after the intervention period. During the intervention period, the experimental group received instruction using bionic reading technology. In this study, respondents were made to read oral reading fluency passages or reading materials that use bolded letters as artificial fixation points. On the other hand, the control group read the traditional oral reading fluency passages or without bionic reading technology. After the

intervention period, the MRQ-R and reading self-efficacy questionnaires were administered again to both groups to determine whether reading motivation and self-efficacy had changed.

The analysis for the gathered data was the descriptive analysis that was used to determine the demographic profile of the participants, as well as the level of motivation to read and self-efficacy in reading for both groups during the pre-and post-intervention periods. Finally, based on the study's findings, intervention or action plans were formulated to enhance the reading motivation and self-efficacy of students with learning disabilities. The study's input, process, and output were thoroughly documented and presented in a research report.

The researchers adhere to the ethics in research. The anonymity and confidentiality of the respondents were ensured and maintained. The data will also be discarded three years after publication. The research ensured that the study caused no risk or harm to the respondents.

III. Results and Discussion

Table 1

Age

AGE	School A	School B	Total	Percentage
14 -18 years old	21	0	21	44.55
10 - 13 years old	39	12	51	34.55
6 - 9 years old	10	17	27`	20.90
	10	1	11	100
	80	30	110	

Based on research, older age groups tend to have lower motivation to learn despite the varied results in different literature (Yamashita et al., 2022). This is associated with underlying cognitive and sensory limitations like hearing and vision and other factors that lower the motivation to learn dementia and hearing loss (Powell et al., 2022) as well. In studies, the motivation of students is lowered without considering gender (Miyamoto, 2023).

Table 2

Gender

SEX	frequency	percentage
Male	67	61
Female	43	39
	110	100

The respondents' sex was included in the study as the male and female students were identified. There was a total of 110 respondents, with 67 of them male and 43 female. The majority, or 61% of the respondents, were male, while the 39% were female. This presented that the direction of the data tilts towards the male. According to Lepper et al. (2022), the sexes of the students appear to have significant relationships in terms of reading interest and comprehension. Findings revealed that the boys' interest was higher in texts that were male-attributed in terms of topics.

Table 3

Grade level

GRADE LEVEL	frequency	percentage
Grades 1 to 3	27	25
Grades 4 to 6	22	20
Grades 7 to 9	40	36
Grades 10 to 12	21	19
	110	100

The respondents of the research included Grades 1 to 12. Forty out of 100 respondents, or 36% of the students, were Grades 7-9 followed by Grades 1 to 3 which take 25% of the sample. The least number belongs to Grades 10 to 12, comprising 19% of the respondents. The distribution of the respondents has no major inclination as the range of the respondents is 21 to 40. With that, the respondents are nearly equally distributed among the grade levels. Toste et al (2020) indicated that the grade level of the students or the students' developmental period can have influence on their reading and motivation. Nootens (2019) stipulated that the disposition of the students in terms

of attitude towards reading was strong in reading for the elementary level compared to the secondary.

Table 4

Summary of the Means of Motivation Levels of School A

	Control Group				Experimental Group			
	Pre-Intervention	Verbal Description	Post-Intervention	Verbal Description	Pre-Intervention	Verbal Description	Post-Intervention	Verbal Description
Reading efficacy	3.02	High	3.02	High	2.85	High	3.60	Very High
Challenge	2.95	High	3.00	High	2.98	High	3.43	Very High
Curiosity	3.00	High	3.07	High	2.93	High	3.51	Very High
Reading involvement	3.06	High	3.05	High	2.83	High	3.50	Very High
Importance of reading	3.00	High	2.97	High	3.04	High	3.53	Very High
Recognition	3.00	High	2.99	High	3.06	High	3.52	Very High
Grades	2.81	High	2.88	High	2.94	High	3.50	Very High
Social Skills	2.81	High	2.88	High	2.94	High	3.50	Very High
Competition	2.70	High	2.80	High	2.70	High	3.55	Very High
Compliance	2.82	High	2.93	High	2.78	High	3.50	Very High
Reading Work Avoidance	2.81	High	2.94	High	2.99	High	3.48	Very High
Mean	**2.91**	**High**	**2.96**	**High**	**2.91**	**High**	**3.51**	**Very High**

Table 4 summarizes the motivation levels of the students from School A. This presents that all the domains in motivation got the verbal description of high to very high. The control group pre and post-intervention. This shows that the learners, even before the intervention, were on high levels of verbal description. For the control group, the domain that got the lowest rating before the intervention was Competition, while the highest was 3.06 which was Reading Involvement. For the post-intervention of the control group, the highest was 3.07 which was curiosity and the lowest was 2.80 which was Competition. For the experimental group, the highest was Recognition with 3.06, while the lowest was 2.70, which was Competition before the intervention. After the bionic

reading, the highest was 3.60, with high remarks for reading efficacy, while challenge was the lowest, with a rating of 3.43. This shows the apparent improvement in the experimental group with the movement of the mean rating from high to very high.

Table 5
Summary of the Motivation Levels of School B

	Control Group				Experimental Group			
	Pre-Intervention	Verbal Description	Post-Intervention	Verbal Description	Pre-Intervention	Verbal Description	Post-Intervention	Verbal Description
Reading efficacy	3.13	High	3.11	High	2.8	High	3.58	Very High
Challenge	2.93	High	2.95	High	3.01	High	3.43	Very High
Curiosity	2.97	High	3.08	High	3.02	High	3.53	Very High
Reading involvement	3.01	High	3	High	2.82	High	3.59	Very High
Importance of reading	3.03	High	3.1	High	2.9	High	3.53	Very High
Recognition	3.09	High	3.03	High	2.96	High	3.41	Very High
Grades	3.08	High	2.8	High	2.92	High	3.48	Very High
Social Skills	2.8	High	2.82	High	2.76	High	3.5	Very High
Competition	2.78	High	2.84	High	2.82	High	3.47	Very High
Compliance	2.81	High	2.93	High	2.81	High	3.53	Very High
Reading Work Avoidance	2.85	High	3.03	High	3	High	3.43	Very High
Mean	2.95	High	2.97	High	2.89	High	3.50	Very High

Table 2 presents the summary of the motivation levels of School B. In the control group, the domain with the highest rating was reading efficacy, with a rating of 3.13, and the lowest was Competition, with a rating of 2.78 during the pre-intervention. On the other hand, the highest in the post-intervention is 3.11, with a verbal description of high, which is reading efficacy, while the lowest is grades, with a rating of 2.80.

As for the experimental group, the highest is reading involvement, with a rating of 3.59, while the lowest is 2.76, which is social skills. On the other hand, after the intervention, the highest is reading involvement, with a rating of 3.59 while the lowest is recognition with the rating of 3.41. There is the noticeable improvement in terms of the experimental group as the mean moved from 2.89 to 3.50 shifting from high to very high. The item that got the highest mean rating is the item on making out words easily that got 3.81, which was sustained to be the highest after intervention but got a lower mean of 3.74 with the verbal description of average. On the other hand, the experimental group rated continuing reading even when the subject was boring, with 3.85 having the verbal rating of average as the highest for the pre-intervention. The mean ratings increased after intervention with reading on their own without an adult's help as the highest having average with a mean rating of 4.31. This implies that the respondents are moderately certain about their

reading efficacy, especially after the reading intervention coming from a state of uncertainty or neutrality.

Based on Shehzad et al (2019), self-efficacy is linked with reading comprehension. However, more is needed to know about its relationship with fluency (Peura et al, 2019). It is further stipulated that reading self-efficacy refers to the reading motivation element that is related to the learner's perceived achievements in reading and cannot be identified as based on gender differences. There may be several factors that may impact the reading efficacy of the students. However, these researchers agree that sex is not a factor in reading motivation. As observed in the classroom during reading activities, males and female alike are engaged in reading activities depending on the content or subject matter.

Table 6
Reading Self-Efficacy of School A

	Control Group				Experimental Group			
	Pre-Intervention	Verbal Description	Post-Intervention	Verbal Description	Pre-Intervention	Verbal Description	Post-Intervention	Verbal Description
1. Read out loud in front of the class	3.26	Low	3.40	Low	3.48	Average	4.12	Average
2. Continue reading even when I find it difficult	3.72	Average	3.63	Average	3.44	Average	4.19	Average
3. Work out the sounds in words I have not seen before	3.44	Average	3.40	Low	3.52	Average	4.06	Average
4. Sound out a word that I find hard to read	3.35	Low	3.19	Low	3.38	Low	4.04	Average
5. Read on my own without an adult's help	3.44	Average	3.51	Average	3.81	Average	**4.31**	**Average**
6. Read things that are harder than the book I normally read at school	3.63	Average	3.65	Average	3.56	Average	3.90	Average
7. Know what I can do to improve my reading	3.70	Average	3.63	Average	3.25	Low	4.00	Average
8. Continue reading even when I find the subject boring	**3.63**	**Average**	3.67	**Average**	**3.85**	**Average**	4.21	Average
9. Read out loud quickly and still get words right	3.56	Average	3.49	Average	3.12	Low	4.33	Average
10. Make out words easily when I read	**3.81**	**Average**	**3.74**	Average	3.19	Low	4.33	Average
11. Improve my reading if I really want to	3.56	Average	3.67	Average	3.44	Average	4.27	Average
12. Continue reading even when I do not like the subject	3.63	Average	3.40	Low	3.58	Average	3.98	Average
13. Read as well as my friends	3.47	Average	3.58	Average	3.56	Average	4.13	Average
14. Continue reading even when I get frustrated	3.49	Average	3.40	Low	3.19	Low	4.25	Average
15. Practice reading in my spare time even when I don't have to	3.19	Low	3.44	Average	3.83	Average	4.19	Average
16. Read without making lots of mistakes	3.58	Average	3.58	Average	3.40	Low	3.90	Average
17. Read difficult books	3.16	Low	3.63	Average	3.40	Low	4.12	Average
18. Read a book I have not read before	3.49	Average	3.51	Average	3.50	Average	3.92	Average
19. Work out the sounds in words I have not seen before	3.37	Low	3.35	Low	3.38	Low	4.12	Average
Mean	3.50	Average	3.52	Average	3.47	Average	4.12	Average

Legend: 4- 3.26-4.0, Very high; 3 - 2.51-3.25, High; 2- 1.76-2.50, Moderate high; 1 -1.00-1.75, - Low

The item that got the highest mean rating is the item on making out words easily that got 3.81 which was sustained to be the highest after intervention but got a lower mean of 3.74 with the verbal description of average. On the other hand, the experimental group rated continuing reading

even when the subject was boring, with 3.85 having the verbal rating of average as the highest for the pre-intervention. The mean ratings increased after intervention with reading on their own without an adult's help as the highest having average with the mean rating of 4.31. This implies that the respondents are moderately certain about their reading efficacy especially after the reading intervention coming from the state of uncertainty or neutrality. In the study of Oranpattanachai (2023), the students' reading strategy and reading self-efficacy have vital roles in enhancing their reading comprehension. It is further stipulated that reading self-efficacy refers to the reading motivation element that is related to the learner's perceived achievements in reading and cannot be identified as based on gender differences.

Table 7
Reading Self-Efficacy of School A

	Control Group				Experimental Group			
	Pre-Intervention	Verbal Description	Post-Intervention	Verbal Description	Pre-Intervention	Verbal Description	Post-Intervention	Verbal Description
1. Read out loud in front of the class	3.26	Low	3.40	Low	3.48	Average	4.12	Average
2. Continue reading even when I find it difficult	3.72	Average	3.63	Average	3.44	Average	4.19	Average
3. Work out the sounds in words I have not seen before	3.44	Average	3.40	Low	3.52	Average	4.06	Average
4. Sound out a word that I find hard to read	3.35	Low	3.19	Low	3.38	Low	4.04	Average
5. Read on my own without an adult's help	3.44	Average	3.51	Average	3.81	Average	**4.31**	**Average**
6. Read things that are harder than the book I normally read at school	3.63	Average	3.65	Average	3.56	Average	3.90	Average
7. Know what I can do to improve my reading	3.70	Average	3.63	Average	3.25	Low	4.00	Average
8. Continue reading even when I find the subject boring	**3.63**	**Average**	3.67	**Average**	**3.85**	**Average**	4.21	Average
9. Read out loud quickly and still get words right	3.56	Average	3.49	Average	3.12	Low	4.33	Average
10. Make out words easily when I read	**3.81**	**Average**	**3.74**	Average	3.19	Low	4.33	Average
11. Improve my reading if I really want to	3.56	Average	3.67	Average	3.44	Average	4.27	Average
12. Continue reading even when I do not like the subject	3.63	Average	3.40	Low	3.58	Average	3.98	Average
13. Read as well as my friends	3.47	Average	3.58	Average	3.56	Average	4.13	Average
14. Continue reading even when I get frustrated	3.49	Average	3.40	Low	3.19	Low	4.25	Average
15. Practice reading in my spare time even when I don't have to	3.19	Low	3.44	Average	3.83	Average	4.19	Average
16. Read without making lots of mistakes	3.58	Average	3.58	Average	3.40	Low	3.90	Average
17. Read difficult books	3.16	Low	3.63	Average	3.40	Low	4.12	Average
18. Read a book I have not read before	3.49	Average	3.51	Average	3.50	Average	3.92	Average
19. Work out the sounds in words I have not seen before	3.37	Low	3.35	Low	3.38	Low	4.12	Average
Mean	3.50	Average	3.52	Average	3.47	Average	4.12	Average

Legend: 4- 3.26-4.0, Very high; 3 - 2.51-3.25, High; 2- 1.76-2.50, Moderate high; 1 -1.00-1.75, - Low

The item that got the highest mean rating is the item on making out words easily that got 3.81 which was sustained to be the highest after intervention but got a lower mean of 3.74 with the verbal description of average. On the other hand, the experimental group rated continuing reading even when the subject was boring, with 3.85 having the verbal rating of average as the highest for the pre-intervention. The mean ratings increased after intervention with reading on their own without an adult's help as the highest having average with the mean rating of 4.31.

In general, the mean rating of the control group before the intervention was 3.50 while the post-intervention as 3.52. This presents a difference that is not that significant to note. On the other hand, the experimental group got a mean rating of 3.47 for the pre-intervention and 4.12 for the post-intervention. All the ratings had a verbal rating of average. The improvement was evident for the experimental group, which proved that the bionic reading technology effectively improved the students' self-efficacy. Deel (2019) indicated that there was no statistical significance with gender and reading self-efficacy. It is further stipulated that reading self-efficacy refers to the reading motivation element related to the learner's perceived achievements in reading and cannot be identified based on gender differences.

Moreover, self-efficacy has been studied in terms of language learning and was correlated with metacognitive skills of the students (Shehzad et al, 2020). Higher self-efficacy and optimism were also related to the higher possibilities of having better language achievements (Karnchanachari, 2020). This implies how technology positively influences skills related to language about self-efficacy which is evident and aligned with the result of the experimental group through the pre- and post-intervention ratings.

Table 8
Paired T-Test

Paired Samples t-test	t- test	p-value	Interpretation
Control and Experimental Group Pre-Intervention	0.448	0.66	No Significant Difference
Control Group Pre- and Post-Intervention	-0.574	0.573	No Significant Difference
Experimental Group Pre- and Post-Intervention	-10.963	< 0.001	Significant Difference
Control and Experimental Group Post-Intervention	-14.43	< 0.001	Significant Difference

Table 8 presents the test of difference of means between the different groups. Between the control and experimental group, no significant difference was obtained with a p-value of 0.660 which means that the experiment started with the two groups of equal means and there are no pre-existing differences between the control and experimental groups. The control group exhibited no significant difference with a p-value of 0.573 after implementing the traditional reading. On the other hand, the t-test between the experimental group's pre- and post-intervention mean scores, with a p-value of less than 0.001, indicates a significant difference after the bionic reading was

implemented. Moreover, the t-test between the post-intervention mean scores of the control and experimental groups, with a p-value less than 0.001, showed that there is a significant difference. This proves that the bionic reading intervention can be considered effective regarding reading motivation and self-efficacy as presented with the paired t-test. The control group had no significant difference between its pre-intervention and post-intervention, while the experimental group showed a significant difference. As stated by Geiser-Norgaard (2021), reading interventions are seen as usual mechanisms to close the identified classroom gaps between the teacher-led intervention and technology-based reading instruction.

The experimental study was conducted to determine the impact of bionic reading among students with learning disabilities in selected schools for the school year 2022-2023. There were 110 respondents, 55 each for the control and experimental groups. An adapted questionnaire for motivation in reading (MRQ-R) and validated reading self-efficacy was utilized. Traditional reading materials were used for the control group, while for the experimental group, the reading bionic technology. Reading activities were conducted before and after the intervention. Statistical tools used were percentage, mean, standard deviation, and ANOVA. The results revealed that most of the constructs of the MRQ-R adapted tool presented no significant difference between the pre- and post-intervention for the control group. On the other hand, the experimental group showed a significant difference in all constructs indicated with responses ranging from high to very high for its verbal description. Despite their learning disabilities, they appear to be motivated in reading and have become more motivated through the intervention. The reading self-efficacy questionnaire also presented a significant difference for the experimental group contrary to the control group's results. The responses ranged from low average to average. Given that they are LDs, the responses on the reading self-efficacy are within the boundaries of expected and acceptable answers.

Based on the gathered data and after having been subjected to statistical tools, the following findings are:

On the Demographic Profile of the respondents. Majority of the respondents are in the age range between 14-18 years old and in grades levels 7 -9, and male-dominated. On the level of reading motivation of LDs of the Experimental group using the reading bionic technology and the Control group using the traditional reading materials. For the control group, in terms of reading efficacy, challenges in reading, reading curiosity, reading involvement, recognition, grades, social, competition, and compliance, and reading work avoidance got a rating of High both pre-intervention and post intervention.

The Experimental group on the other hand, in terms of reading efficacy, challenges in reading, reading curiosity, reading involvement, recognition, grades, social, competition, and compliance, and reading work avoidance got a rating of High during the pre-intervention period and Very high on the post-intervention. On the level of self-efficacy of LDs, the Experimental group used the reading bionic technology and the Control group used the traditional reading material. The control and experimental groups recorded an Average reading self-efficacy before

and after the intervention. There is a significant difference between the level of MRQ-R and the reading self-efficacy of the two groups during the pre-intervention and post-intervention periods. There is a substantial difference between the MRQ-R level and the experimental group's reading self-efficacy after the intervention period. The control group, on the other hand, did not have a significant difference.

IV. Conclusion

Based on the study's findings, it is concluded that the reading motivation and self-efficacy of the students can be enhanced using technology like bionic reading technology compared to traditional reading materials. However, intervention plans can be formulated to sustain or improve the reading motivation of the LDs. In light of the findings, it is recommended that specific learning disabilities and other disability types be considered and narrowed down in future research endeavors. Teachers can consider integrating the reading bionic technology in other content areas since this can work within and across curriculum areas. It is essential to tap all subjects to ensure that reading improvement will be collectively done. The reading self-efficacy items can be further validated by reading experts and LSEN reading professionals for content validation. This may vary based on the learning disability type. Finally, implementation of the Intervention plans within and beyond language is recommended for implementation.

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