

Brain-based learning management in primary students: Language literacy studies



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ABSTRACT

Literacy is a foundational skill essential for learners as it lays the groundwork for success in education and future careers. However, some students face challenges in acquiring this ability, as transitioning from oral language acquisition to textual communication is not a simple task. Brain-based learning (BBL) is an instructional approach that capitalizes on the functioning of the brain in designing curricula, and it holds promise in addressing these challenges. The objectives of this study were twofold: 1) to develop a BBL management approach to enhance Thai students' literacy and proficiency in reading and writing skills in the Thai language, and 2) to implement this BBL management approach with Thai students. The study was conducted in two phases. In phase 1, five experts participated in evaluating the learning management approach. In phase 2, a cluster random sampling method was used to select 78 second-grade students as participants. The research employed various instruments, including teaching management materials for developing Thai language literacy and reading and writing fluency, a learning management evaluation form, pre-posttests for literacy and reading/writing fluency, and a satisfaction questionnaire. Data analysis involved calculating mean scores, standard deviations, and conducting t-tests. The findings of the study revealed that: 1) the learning management approach comprised indicators, content, learning management processes using BBL, instructional materials, and assessments, and it received a very high evaluation; 2) the developed learning management approach proved effective in improving Thai language literacy and fluency in reading and writing. The students' literacy and fluency scores were significantly higher in the posttest compared to the pretest. Moreover, students expressed a very high level of satisfaction with the learning experience provided by the developed learning management approach.

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1. Introduction

Literacy plays a vital role in human development as it empowers individuals with the capacity to comprehend and generate written communication. Proficiency in literacy not only facilitates effective communication but also opens doors to academic pursuits and personal growth (Chall, 1983). Literacy holds paramount importance, particularly for young learners, as it stands as one of the fundamental skills

during the early stages of education. In the process of education, children embarking on the journey of reading engage with symbols that convey both sound and meaning, gradually acquiring the proficiency to employ these symbols for self-expression. As literacy skills progress, individuals attain the ability to comprehend a wide range of texts, ranging from newspaper articles to scholarly papers (Levine, 1986). As a result, developing literacy has become one of the main missions for governments. The literacy rate could even indicate the development of a country.

In addition, fluency in reading and writing is considered an indicator of success in literacy instruction for young learners (Pikulski and Chard, 2005; Ziegler and Goswami, 2005; Ellis, 1997). In detail, students are not expected only to be able to read and write, but they are also demanded to

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practice the skills at a pace that could help them learn effectively (Skehan, 2009). Fluency in reading and writing skills is also a key skill for learning. Brysbaert (2019) suggested that young learners could read at the speed rate of 89-149 words per minute. Graham et al. (1998) indicated that young learners in 1st and 2nd grade had an average handwriting speed of 4-7 words per minute. These numbers are important for young learners who start comprehending textual language before they develop to be fluent readers and writers.

Literacy and fluency in reading and writing skills are prioritized as major skills at the beginning of people's educational path. According to the national core curriculum (MOE, 2008), the ability to read and write is instructed in the first grade of primary school. Thai students are expected to read and write effectively. To clarify, at the finishing stage of basic education, they should be able to percept and interpret the written texts to comprehend the expression of message providers. Likewise, the students are also expected to create written output that follows the lexical and grammatical rules of the language they use. This prepares students for the world of information they encounter after graduation (Intasena and Nuangchalerm, 2022).

Nevertheless, literacy and fluency of reading and writing skills are not simply acquired along the path of education as a number of students are still found to be incapable of reading and writing. Students faced problems in the use of lexical and grammatical rules of the language in both writing and reading. It was reported that the average score of Thai students was at a low level. Moreover, they failed to understand such structures as Thai alphabets, vowels, clusters, and spelling. The situation has not improved as it was expected since a recent study (Sangkhapinyo, 2019) also indicates a similar result suggesting that the literacy rate is still undesirable despite attempts put by officials for decades.

The emerging difficulty in promoting literacy for young learners in the country encourages scholars to put attempts to deal with it. In dealing with problems of learners' literacy, a potential solution should focus on the cause of the problems-brain function.

Therefore, brain-based learning (BBL) management has been employed to solve problems of Thai language literacy. In detail, according to Jensen and McConchie (2020), BBL focuses on designing learning activities based on the function of each brain function. The authors suggested that BBL could boost cognitive functioning, and graduation rates decrease discipline issues, and foster the joy of learning. Moreover, activities in BBL learning management are emphasized to deal with cognitive development-how students learn differently as they age, grow, and mature socially, emotionally, and cognitively (Nuangchalerm and Charnsirinattana, 2010; Khalil et al., 2019; Badiie et al., 2020). Consequently, pedagogical management designed in BBL should be considered an alternative for

improving literacy and fluency of reading and writing skills.

By the rationales mentioned above, the current study employs BBL as the main principle in designing learning management to solve literacy problems of students with purposes of the study to 1) To develop BBL management to develop language literacy and fluency in reading and writing skills for Thai students and 2) to implement the BBL management to develop language literacy and fluency of reading and writing skills for students.

2. Literature review

BBL is a set of educational "techniques" derived from neurology and cognitive science research to increase learning in a safe yet challenging environment, as well as to improve instruction (Connell, 2009). BBL has derived from the idea that activities, teaching plans, and exercise should be designed considering brain function. Jensen and McConchie (2020) indicated that a human brain consists of components responding to different types of input that work parallelly to process and learn the information. Therefore, curriculum designers should create instructional methods to match learners' differences to support a joyful and meaningful class atmosphere. Caine and Caine (1994) suggested that BBL utilizes cognitive function in class management. Jensen (2000) also added that the method is in line with how the brain is wired to learn in the first place including tactics that use the principles of how the brain is functionally and structurally organized, as well as how it operates, rewires, and remaps itself.

Learning L1 to use in daily activities is a natural process. Children start by imitating the adult's language, conceptualizing the meaning, and using it in meaningful communication (Hyams, 1986). However, acquiring literacy could be different. The language has a complicated structure. To be able to read and write fluently, learners have to acquire the knowledge of the alphabet, spelling system, clustering, word compound, vowel, tone, etc. The difference in tone can change the meaning of the whole sentence. Therefore, it is not easy for Thai students to acquire literacy at an early age of learning. These processes demand time and learners' concentration which might be an issue for young learners. In this case, BBL could be an alternative solution as it helps instructors design learning management that serves students' brain function, cognitive processes, and nature of learning (Intasena and Nuangchalerm, 2022).

Considering the potential of BBL in developing children's literacy, scholars in the area have employed the method to solve problems in their contexts (El-Henawy, 2019; Inphitak, 2019; Lagoudakis et al., 2022; Özden and Gültekin, 2008; Zoccolotti et al., 2005). For instance, El-Henawy (2019) designed BBL management to improve elementary students' English skills. The results indicate both improvements in skills and a positive attitude toward learning management. Özden and

Gültekin (2008) found that learning management designed in BBL was capable of improving students' learning achievement and endurance of learning. It was found that students can concentrate on learning activities longer after participating in-class exercises. Moreover, Lagoudakis et al. (2022) explored the application of BBL elements in a biology course and investigates its impact on students' performance. It discusses the integration of neuroscience findings into instructional practices to enhance learning outcomes.

3. Research method

The study was divided into 2 phases. The detail of each stage of data collection can be seen below.

3.1. Phase 1

Phase 1 was to develop language learning management to develop literacy and fluency in reading and writing skills for Thai students. Participants were 5 experts in the area assigned as evaluators of the learning management. The instruments were the Thai language learning management to develop literacy and fluency of reading and writing skills for Thai students and an evaluation form. The learning management was developed by analyzing problems and needs faced by officials taking responsibility for developing literacy and fluency of reading and writing skills including

educational inspectors, school administrators, and teachers. The blinded assessment was employed in the evaluation process. In the data analysis, mean score and standard deviation were employed.

3.2. Phase 2

Phase 2 was to implement and evaluate the developed Thai language learning management to develop literacy and fluency in reading and writing skills for Thai students. Participants were 78 second-grade students from 5 primary schools selected by a clustered sampling method. The participants were not in a learning disability condition. The instruments were the developed Thai language learning management to develop literacy and fluency of reading and writing skills for Thai students, a literacy pre-post-test, reading and writing fluency pre-post-test, and a satisfaction questionnaire. In the data analysis, mean score, standard deviation, and dependent t-test.

4. Results and discussion

The results of the study are discussed following the purposes of the study. The results are shown below. The data for the first phase of research can be summarized that the quality of BBL management is at the highest level of appropriateness. The results are shown in Table 1.

Table 1: The learning management evaluation

Evaluation issues	\bar{X}	SD	Level of appropriateness
Background and rationale	4.60	0.54	Highest
Theoretical framework used in designing the learning management	4.60	0.56	Highest
The purposes of the learning management	4.80	0.44	Highest
Content	4.81	0.35	Highest
Components of the learning management	4.80	0.44	Highest
Instruments	4.40	0.54	Highest
Management processes of the learning management	4.60	0.54	Highest
The expected outcomes of the learning management	4.62	0.51	Highest
Average	4.65	0.20	Highest

The result of the study shows that learning management consists of components including indicators, content, purposes, processes of learning management using BBL, instructional material, and assessment. The content includes principles in reading and writing in the Thai language. The processes of the implementation focus on contributing learning environment, opening learning opportunities, and concentrating learners on the contents. The results of the study indicate that the average score of the learning management evaluation was found at a very high level ($\bar{x}=4.65$, $SD=0.20$). In detail, the evaluation aspects including content ($\bar{x}=4.65$, $SD=0.20$), the purposes of the learning management ($\bar{x}=4.80$, $SD=0.44$), components of the learning management ($\bar{x}=4.80$, $SD=0.44$), the expected outcomes of the learning management ($\bar{x}=4.62$, $SD=0.51$), background and rationale ($\bar{x}=4.60$, $SD=0.54$), theoretical framework used in designing the learning management ($\bar{x}=4.60$, $SD=0.56$), and management processes of the learning

management ($\bar{x}=4.60$, $SD=0.54$) were found at a very high level respectively. Meanwhile, the aspect of Instruments ($\bar{x}=4.40$, $SD=0.54$) was found at a high level. It could be interpreted that the learning management was appropriate for implementing in developing processes of Thai language literacy and fluency of reading and writing skills for Thai students. The result of the study indicates that the developed learning management was found to be appropriate in developing students' literacy and fluency in reading and writing skills. In detail, the learning management was designed with the BBL principle. Activities and contents in the learning plan were designed considering the problems and needs of learners. Class activities and exercises were designated to create a joyful and meaningful learning atmosphere that matches young learners' learning nature. According to Jensen (2000), the potential of instructional management designed in BBL is how it connects the knowledge in learning processes and helps learners to develop cognitive processes. The

developed learning management consists of the learning processes that contribute learning environment, open learning opportunities, and concentrate learners on the contents. The contents

are connected and contribute to cognitive processes needed in learning to read and write in the Thai language. The effectiveness of the BBL learning management can be shown in [Table 2](#).

Table 2: The effectiveness of the learning management

N	Evaluation	Full mark	Effectiveness of learning management		
			\bar{X}	SD	%
78	Process	300	249.82	3.49	83.27
	Product	30	25.57	1.41	85.23
E1/E2 = 83.27/85.23					

The results of the study indicate that the developed learning management was effective in developing Thai language literacy and fluency of reading and writing skills (EE=83.27/85.23). In detail, the average in-class score of students was 249.82 of 300 full marks (83.27%). Moreover, the average score of students after learning in learning management was 25.57 of 30 full marks (85.23%). It could be interpreted that learning management positively affects students' literacy and fluency of reading and writing skills both in-process and after the end of the process.

The result of the study indicates the benefit of the learning management designed in BBL on students' literacy. The result of the study provides more evidence to support the previous studies finding BBL as an effective solution in solving instructional

difficulties (El-Henawy, 2019; Inphitak, 2019; Özden and Gültekin, 2008; Zoccolotti et al., 2005). The learning management was designed to serve the nature of students' learning process. Each activity takes only 10-15 minutes and is designed to promote class participation and physical involvement. As a result, learners at the age of 8 whose brains are developed to percept information through such activities were able to learn and acquire the ability to read and write. According to Caine and Caine (1994), the effectiveness of exercises and activities in BBL relies on their suitability to learners' individual differences. The development of students' literacy in this study could be considered the result of such a design. Language literacy overall is studied and reported in [Table 3](#).

Table 3: The effect of learning management on students' language literacy

N	Students' literacy	\bar{X}	SD	t	p
72	Pretest	13.28	1.40	44.31	0.00*
	Posttest	25.57	1.41		

*: p>0.05

The results of the study indicate an improvement in the student's literacy. A paired t-test indicates a significant difference between the students' posttest (\bar{x} =25.57, SD=1.41) and pretest (\bar{x} =13.28, SD=1.40), t=44.31, p=0.00. It could be interpreted that students' literacy was improved after learning in learning management. The result of the study also suggests the fluency of students' reading and writing skills after learning in the developed learning management. The result of the study goes along with other studies that also found the benefit of BBL in developing language skills (El-Henawy, 2019; Zoccolotti et al., 2005). It seems that exercises and activities in learning management could also bring

about fluency in students' reading and writing skills. According to Skehan (2009), fluency in L1 development occurs when learners acquire the target language and are stimulated to use them at a certain frequency. Input processing in reading and output production in writing need repetition to let learners expertise them. Learning management consists of activities and exercises that contribute to repetitive practices of the skills at the same level of difficulty. Consequently, students were given opportunities to repetitively practice reading and writing at a level that could result in the fluency of their skills. Language literacy in the aspect of reading and writing skills is studied and reported in [Table 4](#).

Table 4: Student's fluency in reading and writing skills

N	Students' literacy	\bar{X}	SD	t	p
72	Pretest	13.498	1.46	46.56	0.00
	Posttest	25.572	1.41		

The results of the study indicate an improvement in the student's fluency in reading and writing skills. A paired t-test indicates that the students' posttest (\bar{x} =25.57, SD=1.41) was significantly higher than the pretest (\bar{x} =13.49, SD=1.46), t=46.56, p=0.00. It could be interpreted that students' fluency in reading and writing skills was improved after learning in learning management. The results are shown in [Table 5](#). The results of the study indicate that the students were satisfied with learning in learning

management. The average student's satisfaction with learning management was at a very high level (\bar{x} =4.67, SD=0.44). In detail, the students were satisfied with class activities, exercises, and class management. Moreover, it was also reported that students felt they would like to study the subject every day. Therefore, learning management could bring about students' positive attitudes toward developing literacy and fluency in reading and writing skills.

Table 5: Students' satisfaction with the learning management

No.	Item	\bar{X}	SD
1	I would like to study Thai language courses every day	4.46	0.50
2	I like teachers' teaching methods.	4.73	0.44
3	I am proud to be able to read and write.	4.84	0.36
4	I like doing class exercises	4.67	0.49
5	I like doing class activities	4.82	0.38
6	I like the material used in activities	4.67	0.49
7	I am not bored of learning to read and write	4.56	0.49
8	I am happy to do class exercises	4.57	0.49
9	I am proud of the work I do in the classes	4.70	0.45
10	I am joyfully doing class activities	4.87	0.33
11	I like the variety of class activities	4.89	0.30
12	I like the processes of class activities	4.89	0.30
13	I like class activities because it helps me to practice reading and writing	4.44	0.55
14	I like learning management as it opens opportunities to express free and creative opinions	4.44	0.52
15	I like the way teachers summarize and connect class contents	4.50	0.50
	Average	4.67	0.44

The result of the study indicates students' positive opinions toward learning management. Students were satisfied with class activities, exercises, and class management. Moreover, it was also reported that students felt they would like to study the Thai language every day. The study results align with El-Henawy (2019), who also found participants' positive opinions towards BBL learning management. Jensen and McConchie (2020) suggested that joyful activities in the BBL could also motivate learners to concentrate and take part in the class with pleasure. Also, it can be considered active learning that promotes and engages students in their lessons as well (Nuangchalerm, 2020; Kulachit and Nuangchalerm, 2021). BBL is an innovative learning organization that can enhance language literacy for all students. It can be engaged in contemporary instruction.

5. Conclusion

The findings of this study demonstrate the effectiveness of the implemented learning management approach, which aligns with the principles of BBL, in fostering language literacy and enhancing reading and writing fluency. The evaluation of the learning management approach indicated its suitability for implementation in the developmental processes of learners' skills. Additionally, the implementation of the developed learning management approach yielded improvements in students' literacy and fluency in reading and writing skills. Consequently, it can be concluded that BBL proves to be an effective principle for the advancement of young learners' language skills, specifically in reading and writing in the Thai language, at a standardized pace. Furthermore, the preference for BBL among students is evident, as the approach incorporates exercises and activities that promote enjoyable learning experiences.

6. Recommendation

The findings of this study carry significant pedagogical implications, offering guidance to instructors and educational administrators in the design of curricula, learning management systems,

and lesson plans using the principles of BBL. The study demonstrates that implementing BBL principles fosters a meaningful and enjoyable learning environment for students. Notably, BBL emerges as an alternative approach for the development of young learners, as it enhances their concentration and enjoyment during learning activities. From an academic standpoint, this research provides further evidence to support the effectiveness of BBL and encourages scholars to employ this principle in the design of instructional materials for learners across diverse geographical contexts. Given that BBL capitalizes on the functioning of the brain in classroom management, its promotion holds the potential to empower learners in the development of literacy, a foundational element for a promising future.

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Compliance with ethical standards

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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