The effect of training on vocabulary strategy use: explicit teaching of word family, word network and word card strategies

Constance Lavoie[1]

ARTICLE INFO	ABSTRACT
	This study measured the impact of explicit teaching of three lexical strategies on the extent to which these strategies were used when faced with unknown words. Seven elementary school teachers from different Innu communities implemented three vocabulary strategies (word family, word network and word card) for a period of three weeks. To assess the impact of strategy training, the students in the experimental ($N = 39$) and control groups ($N = 15$) performed tasks using the targeted strategies. There was a statistically significant difference between the two groups, with the experimental group using more efficiently the strategies taught. These results confirmed the positive impact that explicit teaching of vocabulary strategies and it describes the progress made by the students regarding strategic use.

This study took place in seven Innu communities in Quebec. Innu communities are located on St-Lawrence's river North coast. These remote and isolated communities are socioeconomically disadvantaged. We know that child vocabulary is correlated his economical environment (Hart & Risley, 2003). Moreover, Indigenous children have a limited vocabulary in their Indigenous language and in French because Indigenous communities and families face linguistic devitalization as a consequence of residential schools (1920-1996) (Hot & Terraza, 2011). Facing this reality, the author and the elementary school teachers (including special education teachers) involved in this study opted to develop vocabulary learning strategies to teach French lexicon. This study is rooted in modern cognitive approaches to vocabulary teaching-learning strategies. Biemiller and Boote (2006) encourage explicit instruction of vocabulary-building strategies to make the best use of teaching/learning efforts as well as to provide a way of extending the learning process beyond the confines of the classroom. To do so, in this study, three strategies (word family, word network and word card strategies) were choosen. Then, the teachers

[1] Université du Québec à Chicoutimi, constance.lavoie@uqac.ca, (001-418-545-5011 ext. 4304).

learned to teach these strategies effectively and systematically. This study addresses the following research questions: "Do students naturally use these three strategies?", "Do students reuse learned strategies when facing new vocabulary?", "How do students use strategies taught when facing new vocabulary?". This article first presents the theoretical aspects of the lexical learning process involved in the three vocabulary learning strategies used in the study. The methodology used and results of the use of three vocabulary teaching-learning strategies by the students at pre-test and post-test are then presented. Finally, the results are discussed, the limitations of the study examined and pedagogical recommendations are made.

Theoretical Background

For the purposes of this study, three vocabulary strategies were selected: the word family (or word parts), word network and word card strategies. The teachers selected the strategies to be examined from among those presented by the researcher. They were chosen by the teachers for the fact that they are visual, task-based, and included oral transmission. Teachers mentioned that these characteristics suited the Indigenous teaching context. In Indigenous cultures, the kinesthetic and experiential aspect of vocabulary learning should be included during listening and speaking activities (Kitchen, Hodson & Cherubini, 2011; Barnhardt & Kawagley, 2005). In addition, they selected the word family strategy, because their students' first language is a polysynthetic language that uses a multitude of morphological derivations. The teachers wanted to examine the word network strategy, because it promotes comprehensive and simultaneous vocabulary learning, which they believed was suited to their students' learning styles. Finally, the teachers opted for the word card strategy, because they liked the visual and tangible learning of vocabulary words afforded by this strategy.

The Word Family Strategy. A word family is the set of words that include a root word (e.g., clear) and its inflections formed by addition of various suffixes (e.g., clear***ance***, clear***ing***, clear***ly***) and prefixes (e.g., ***un***clear). Words that belong to the same morphological family are related by meaning (e.g., family, familiar, unfamiliar, familiarity, familiarise). This process of word formation is also known as the derivational process or morphological derivation. Understanding the mechanism of morphological derivation is seen as a key to vocabulary acquisition because it affects most words (Treville & Duquette, 1996). Many words in French and other languages stemming from Latin or Greek make use of affixes. Although many affixes occur in the French language, some of them are much more common than others. Nation (2001) recommends teaching the meaning of the affixes that occur most frequently. This can be done by providing a list of the most common affixes and their meanings (Simard & Chartrand, 2011, p. 224-231) as well as by working with learners to help them gain the ability "to see how the meanings of the stem and affix combine to make a new but related meaning" (Nation, 2001, p. 274). Learning this word part or word family strategy involves four types of vocabulary knowledge that are developed in the following order: receptive, relational, syntactic and distributional (Roy & Labelle, 2007; Tyler & Nagy, 1989). Receptive knowledge is the ability to recognize a number of common affixes (e.g., re-, de-, un-, -tion, -ful, -less). Receptive knowledge also makes it possible to identify some words that appear similar, but do not belong to the same word family because they do not share a semantic connection (e.g., family and famine). Relational knowledge is the ability to recognize that two words share a common morpheme (e.g., work**er** and danc**er**). Syntactic knowledge allows us to recognize the syntactic change that results when an affix is added (e.g., the verb *manage* becomes the noun *manag**er***). According to Daviault (2012), syntactic knowledge develops during the third through sixth grades in primary school. Distributional knowledge is the ability to use affixes in the right context. Although this knowledge improves throughout primary school, it is still not completely mastered in Grade 6. Exercises such as word-making and analysing the meaning of new words as a team are examples of how the word-parts strategy can be implemented (Table 1). Nation (2001) also encourages learners to take risks by guessing the meaning of

word parts. Electronic dictionaries can be used by learners to verify that a new word they have made exists and to check its meaning, and other words related to its family.

Figure 1
Exercise used in this study to put the word family strategy into practice

	Find the root word	Break down the word. Identify the prefix in blue and the suffix in red.	Form some new words by adding prefixes to the root word.	Form some new words by adding suffixes to the root word.
interesting				
sand				
attentively				
kneel down				
recover				

Explain the meaning of the words

Finally, Bertram, Laine and Virkkala (2000) explained that when students use the word family strategy, they can guess the meaning of an unknown word by combining the meanings of each morpheme. In addition, according to several studies (Anglin, 1993; Chialant & Caramazza, 1995; Nation, 2001), an understanding of the derivation process can be used to increase vocabulary size.

The Word Network Strategy. This strategy consists of bringing out the meaning relationships of words surrounding a theme word, naming categories, and making the information associated with the words explicit. Word networks go beyond semantic mapping (Treville, 2000), because the network of associations may be semantic (Figure 3), but may also be phonemic, syntactic or morphological, among other possible connections. The word network strategy involves a level of processing of lexical units that would be classified as "deep" according to the theory of Craik and Lockhart (1972). According to that theory, there are various levels of processing of lexical units, ranging from shallow to deep. Shallow processing only involves attention to the form of the elements to be processed, including the sound, spelling or physical appearance, such as the number of vertical lines in a word. Deep processing requires attention to the meaning of the word being learned. Increasing cognitive effort by using active learning improves retention. A study by Kimble, Craik and Tulving (1975) showed that exercises involving reasoning and manipulation of terms further facilitate memorization of lexical units when compared to tasks involving repetition or phonemic tasks. As building word networks involves reasoning and manipulations, this strategy should leave a rich and detailed memory trace.

The word network strategy enables students to connect words in a chain. Aitchison (2012) and Tremblay (2009) recommend teaching vocabulary as a network of terms linked by various meaning relationships, because the lexicon is structured and the acquisition and retention of new lexical elements is influenced by the creation of various associative links.

The Word Card Strategy. The word card technique consists of using small cards to create a connection between the form and the meaning of a target word and to write down information about the word (Figure 2). The first step is to choose common words that are not too easy (Nation, 2001). According to previous studies, certain information should be included in addition to the word to be learned, such as the first language translation (Lado, Baldwin & Lobo, 1967), pictures (Paivio & Desrochers, 1981; Standing, 1973), and collocations in sentences (Laufer and Shmueli, 1997). Word cards make it possible to combine visual and verbal information, thereby optimizing memorization of lexical units, according to Paivio's dual-coding theory (1971). The fundamental idea of this theory is that the information is stored in

two different coding systems: the verbal and the visual. Word cards can be good tools for learning and reviewing words if they are used effectively: "The quality of learning from word cards will depend on the way that they are used" (Nation, 2001, p. 305). Nation (2001) recommends adjusting the number of words in a pack of cards to suit the difficulty of the words, using recall, learning receptively and then productively, and changing the order of the cards depending on the acquisition process. Word cards offer qualitative organization and storage of knowledge about the target words. In addition, word cards are easy to consult and can be used in many different ways. They thus facilitate reviewing and re-using words studied in other exercises.

Figure 2
Model used to teach the word card strategy in this study

Methodology

This study was in part participatory, because its subject was chosen based on the needs expressed by the teachers and special education teachers. The teachers and special education teachers of the schools also chose the words, themes and images used in the study. They also collaborated in preparing the exercises used to teach each of the chosen strategies.

Participants. All participants were Indigenous. The experimental group consisted of seven third-grade classes located in seven Indigenous communities. Each of the teachers of these classes had received four days of training focused on teaching and using the strategies. Five or six students in each class were selected for data collection to ensure participant homogeneity and result validity *(N* = 39). The criteria for selection of the study participants were: 1) having average skills in French, and 2) ensuring balanced gender representation. There were a total of 22 girls and 17 boys in the experimental group. The same selection criteria were applied to generate the control group. The control group consisted of 15 third-grade students (5 girls and 10 boys) in three classes in the same schools of the experimental group. The students in the control group received no explicit instruction. The teachers of these classes had not received training in vocabulary strategies. The students of the control group report that the main vocabulary taught were copying and recopying the words before dictation. The three classes in the control

group were in the same communities to ensure the representation of the sociolinguistic and socioeconomic realities.

*Fidelity of Implementation***.** To increase the degree to which actual implementation was consistent with the strategy as designed, a logbook was given to each teacher in the experimental group. The logbook reiterated each step for teaching the strategy (naming the strategy to be taught, showing a pictogram, describing the strategy, clarifying its purpose, explicitly teaching the strategy using brief demonstrations, specifying when this strategy can be useful, conducting a guided exercise, practicing the strategy independently, and evaluating learning). The teachers in the experimental group completed their logbook after each intervention and turned it in at the end of the experiment.

Procedure. The special education teachers administered the pre-test to the students selected for the control and experimental groups before the start of the intervention. After the pre-test was administered, the seven third grade teachers in the experimental group began teaching the three strategies (word family, word network and word card) three times a week for a period of three weeks (to have more detail on the teaching methods, see AUTHOR & Le, 2014; AUTHOR & Le, 2013; AUTHOR & Le, 2013b). At the end of the three weeks implementation period (May 13–14, 2013), the same test was administered to the participants.

Each teacher worked with the same three lists of 15 words per week; the words on each list were all associated with a particular theme and picture (Week 1: bannock; Week 2: traditional camp; Week 3: skinning a beaver). The teachers of the classes in the control group received the same three word lists as the teachers in the experimental group, but they incorporated these words in their usual vocabulary teaching routine which consisted largely of dictations and copying words without explicit teaching. They were not familiar with the three strategies examined in the study (word family, word network and word card).

Data Collection Instruments. To assess the impact that explicit teaching of lexical strategies had on students, three tasks were used, each accompanied by an observation sheet on which to record the processes, tools and metacognitive explanations describing the student's work. The three tasks were individually administered by the special education teachers. The distance between the seven communities made it too costly to have research assistance for the administration of tests. The students were asked to identify one or more unknown words on the provided list (see Appendix). The first tasks consisted of asking the student to guest the meaning of a new word and to explain their strategy. For the first task, we had chosen words with wordparts (ex.: peacefully, butchering, etc.) so that they could apply the word family. The second task was to explain the meaning of a word in relation with other words from a list. If the student were doing so verbally, we asked to illustrate the mental organization and classification he/she made on a sheet. The purpose of the second task was to see if the student were using the word network strategy. The third task was to show a memorization strategy they use to review a new word. The purpose of the third task was if the students use the word card strategy. The students were allowed to use a wide variety of resource materials, including pictograms of the three strategies, a picture related to word list, a dictionary, a grammar book and a chart listing the meanings of common French affixes (Simard & Chartrand, 2011). There was no time limit for either the pre- or post-test. The same list of words was provided for each task at each passation (see Appendix). Although the words differed from those taught during the three-week implementation period, they were related to varying degrees. For example, the word *paisible**ment*** (peacefully) has the same suffix as the word *attentive**ment*** (carefully), taught during Week 1; the word *servi**able*** (helpful) has the same suffix as *agré**able*** (pleasant), taught during Week 2; and the words *le dépeçage, la tranche, transporter* and *étirer* (butchering, slice (noun), transport and stretch) belong to the same word families, respectively, as the words *dépecer, trancher, porter* and *étiré* (butcher, slice (verb), carry and stretched), taught during Week 3.

Analytical Methods. First, three coding scales with five levels were used to encode the data.

Table 1
Coding scales for the word family, word network and words card strategies

	0	1	2	3	4	5
Word family	No attempt	Incorrect root	Correct root	Correct root + meaning attempt	Correct root + meaning attempt + correct affix(es)	Correct root + correct affix(es) + correct meaning(s) of affixes
Word network	No attempt	Theme word	Theme word + several words listed	Theme word + category(ies) + several words categorized	Theme word + categories + many words categorized	Complete network with almost all words categorized
Word card	No attempt	Word	Word + 1 piece of information	Word + 2 pieces of information	Word + 3 pieces of information	Word + 4 pieces of information

The results for the two groups were compared using multivariate analysis of variance with repeated measures to correct for inflation of Type 1 error. Then, univariate analyses of variance with repeated measures were conducted independently for each of the three scales. More specifically, the initial pre-test results for the two groups were compared. Then, the results of the post-test – administered after the three-week intervention of teaching vocabulary strategies (word family, word network and word card) – for the two groups were compared. Finally, the pre-test/post-test changes for the application of three strategies were assessed for each group. By comparing the results obtained by the same students at two different times, the use made by the students in each group could be measured. For all the analyses, the *F*-test results are presented with the interpretation, using the *p*-value to determine the extent of randomness. The partial eta-squared (η^2; Cohen, 1988) is also shown as a measure of effect size. According to Cohen, an eta-squared value of 0.2 corresponds to a small effect size, a value of 0.5 to an average effect size and a value of 0.8 to large effect size.

Results

The aim of this study was to investigate the impact of explicit teaching of word family, word network and word card strategies on the use of these strategies by students facing new vocabulary.

Preliminary Analyses. Before the multivariate analysis of variance with repeated measures was performed, the assumptions for this type of analysis were examined. First, the asymmetry indices for the three strategies (-0.19 to 2.91) at pre-test and post-test showed that the results did not have a normal distribution. Consequently, the variables were log-transformed to normalize the distributions, as recommended by Tabachnick and Fidell (2007). The three strategies were shown to be normally distributed after transformation (skew = -0.77 to -1.75). All subsequent analyses were performed on the transformed data. To facilitate interpretation and presentation of the results, however, the averages of the untransformed data are presented in the tables and text. Second, the homogeneity of the variance and covariance matrices between the two groups was assessed using Box's test. The results indicate that the variance-covariance matrices were not significantly different between the two groups, Box index = 33.90, *p* = 0.14.

Principal Analyses. As mentioned above, multivariate analysis of variance with repeated measures was performed to examine the differences between the two groups at pre-test and post-test for all three strategies simultaneously. The results showed a significant difference between the two groups for the three strategies, $F(3, 51) = 6.89$, $p = 0.00$, $\eta^2 = 0.29$. Moreover, the results showed a significant time effect for the application of the three strategies, $F(3, 51) = 21.52$, $p = 0.00$, $\eta^2 = 0.56$. Finally, and of critical importance to this study, these main effects are qualified by a significant interaction, $F(3, 51) = 18.24$, $p = 0.00$, $\eta^2 = 0.52$,

suggesting that the changes in the pre-test/post-test results for the use of the three strategies are different for the two groups.

Pre-test Results. The pre-test results showed that the experimental group (N = 39) and the control group (N = 15) were not statistically different, $F(3, 51) = 1.61$, $p = 0.20$, $\eta^2 = 0.09$. The averages for each of the strategies are similar for the two groups (Table 2). The pre-test averages for the word family strategy indicate that, before being taught the strategy, the students in both groups made no attempt to find the word family or, at best, they identified the incorrect root of the unknown word. For the word network strategy, the pre-test averages for both groups correspond to no attempt or, at best, writing down the theme word for the word network. The pre-test averages obtained for the word card strategy indicate that the students made no attempt or, at most, they wrote down the unknown word on the card.

Table 2
Multivariate analysis of variance with repeated measures of pre-test and post-test results for the use of word family, word network and word card strategies in the experimental and control groups

	Experimental group				Control group				F	
	Pre-test		Post-test		Pre-test		Post-test		*Time*	*Group x Time*
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*		
Word family	0.58	1.08	2.18	1.08	0.60	0.91	0.87	0.92	29.44*	12.44*
Word network	0.40	0.84	2.43	1.47	0.20	0.41	0.20	0.56	26.02*	28.41*
Word card	0.35	0.95	2.98	1.48	0.67	0.90	0.73	0.96	38.02*	35.91*

* $p < .05$

Post-test Results. The post-test results indicate that the experimental group (N = 39) and the control group (N = 15) were statistically different, $F(3, 51) = 16.10$, $p = 0.00$, $\eta^2 = 0.49$. The averages for each of the use of the strategies differ between the two groups (Table 2).

Word Family Strategy. After learning to use the word family strategy for three weeks, the average score for the students in the experimental group (M = 2.18, SD = 1.08) differed significantly from that of students in the control group (M = 0.87, SD = 0.92), $F(1, 53) = 16.54$, $p = 0.00$, $\eta^2 = 0.24$. In addition, the results of univariate analysis of variance with repeated measures showed a significant time effect for the word family strategy, $F(1, 53) = 29.44$, $p = 0.00$, $\eta^2 = 0.36$. Further, the main effect is qualified by a significant interaction, $F(1, 53) = 12.44$, $p = 0.00$, $\eta^2 = 0.19$, suggesting that the change in scores for the word family strategy after three weeks differs between the two groups. The level of application made by the students in the experimental group between the pre-test and post-test was statistically significant, $F(1, 39) = 62.94$, $p = 0.00$, $\eta^2 = 0.61$. As for the control group, the pre-test and post-test results were not significantly different, $F(1, 14) = 2.32$, $p = 0.00$, $\eta^2 = 0.14$. Specifically, the post-test average for the students in the experimental group corresponds to an attempt to explain the meaning of the unknown word using the root word. For example, for the unknown word *préparatifs* (preparations), a student attempted to explain the word, saying: "Preparations, that means preparing" (Student 3MAM). After three weeks of explicit instruction, 43.6% (n = 17) of the students in the experimental group found the correct root of a new word and attempted to explain the meaning based on that root compared to 13.3% (n = 2) in the control group. On the other hand, 40.0% (n = 6) of students in the control group made no attempt to guess the meaning without using morphological evidence compare to 10,0% (n = 4) in the experimental group.

Word Network Strategy. After learning to use the word network strategy for three weeks, the average score for the students in the experimental group (M = 2.43, SD = 1.47) differed significantly from that of students in the control group (M = 0.20 , SD = 0.56), $F(1, 53) = 35.89$, $p = 0.00$, $\eta^2 = 0.40$. In addition, the results of univariate analysis of variance with repeated measures showed a significant time effect for the word network strategy, $F(1, 53) = 26.02$, $p = 0.00$, $\eta^2 = 0.33$. Further, the main effect is qualified by a significant interaction, $F(1, 53) = 28.41$, $p = 0.00$, $\eta^2 = 0.35$, suggesting that the change in scores for the word

network strategy after three weeks differs between the two groups. The use made by the students in the experimental group between the pre-test and post-test was statistically significant, $F(1, 39) = 76.40$, $p = 0.00$, $\eta^2 = 0.66$. As for the control group, the pre-test and post-test results were not significantly different, $F(1, 14) = 0.12$, $p = 0.73$, $\eta^2 = 0.01$.

Figure 3
Work of a student (1UALDJ) that is representative of the average attained by the experimental group at post-test for the word network strategy
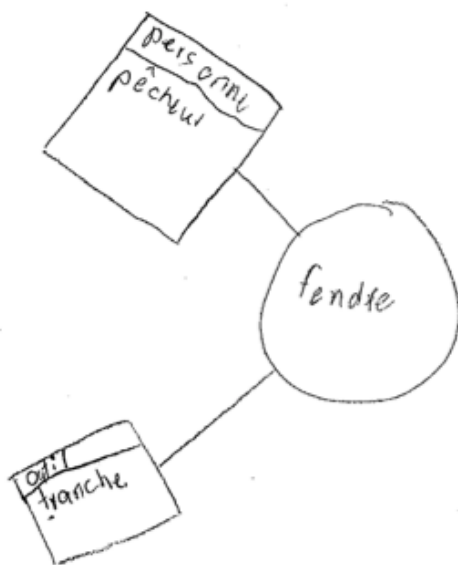
Note. Fendre = split; *personne* = person; *pêcheur* = fisherman; *outil* = tool; *tranche* = slice.

On the one hand, 48.7% ($n = 19$) of the students in the experimental group were able to construct a network around a central word, building categories and classifying some words from the list within the categories (Figure 3). After only three weeks of the intervention, 17.9% ($n = 7$) of the students in the experimental group succeeded in developing a complete word network structure with categories using all or almost all the words. In contrast, 86.7% ($n = 13$) of the students in the control group still could not construct a word network at post-test.

Word Card Strategy. After learning to use the word card strategy for three weeks, the average use for the students in the experimental group ($M = 2.98$, $SD = 1.48$) differed significantly from that of students in the control group ($M = 0.73$, $SD = 0.96$), $F(1, 53) = 29.93$, $p = 0.00$, $\eta^2 = 0.36$. In addition, the results of univariate analysis of variance with repeated measures showed a significant time effect for the use of the word card strategy, $F(1, 53) = 38.02$, $p = 0.00$, $\eta^2 = 0.42$. Further, the main effect is qualified by a significant interaction, $F(1, 53) = 35.91$, $p = 0.00$, $\eta^2 = 0.40$, suggesting that the change in scores for the word card strategy after three weeks differs between the two groups. The use made by the students in the experimental group between the pre-test and post-test was statistically significant, $F(1, 39) = 127.39$, $p = 0.00$, $\eta^2 = 0.76$. The progress of students in the experimental group can thus be described as large according to Cohen's guidelines. As for the control group, the pre-test and post-test results were not significantly different, $F(1, 14) = 0.13$, $p = 0.91$, $\eta^2 = 0.00$.

Figure 4
Work of a student that is representative of the average attained by the experimental group at post-test for the word card strategy

Note. Préparatifs = preparations; *Ma mère qui prépare mon midi* = My mother preparing my lunch.

With regard to the word card strategy, after the three-week intervention, 28.2% (n = 11) of the students in the experimental group were able to make a mental representation by drawing the word to be remembered, providing a definition or by using the word in a sentence; 30.8% (n = 12) also completed information such as the word class and 12.8% (n = 5) completed their word card by adding a related word or other information (e.g., the translation). Among the students in the control group, 60% (n = 9) still made no attempt to create a word card during the post-test.

Discussion

The data were analyzed with regard to the main research question, namely: "Do students use vocabulary strategies taught when facing new vocabulary?". The data confirmed that, as expected, the explicit teaching of the three strategies has a very positive impact on the use of these strategies by students and students do not learn the strategies naturally. First, when comparing the experimental group and the control group, there is a statistically significant difference for all three strategies on the post-test, with the experimental group scoring higher. In addition, the analysis of the work of students in the control group shows that some attempted to create word cards or word networks, but that these strategies are not acquired spontaneously without explicit instruction. This shows that explicit teaching of these strategies is needed to help students progress in learning and remembering new words. The factors that may explain the recall of the strategies learned by the students in the experimental group when facing new words are examined below.

To start with, by offering students varied and meaningful activities such as finding the root and the prefix (word family strategy), finding links between words and categorizing them (word network strategy) or illustrating a word (word card strategy), the teacher holds the students interest and helps them actively participate in learning: "It became fun to work on vocabulary; [using these strategies] promotes teamwork and is enjoyable" (teacher). In addition to being fun, the word card strategy encourages students with learning difficulties to use it: "I have a student with major behavioural problems and learning difficulties, but when this boy was working on his word card, he finished along

with the others" (teacher). The fact that learning these strategies was associated with fun and encouragement have probably contributed to the fact that students reuse them in other context. Graves (2009) has also pointed out that motivation is the first key element to put in place for learning new words. The fact that words were representative of Indigenous context (ex. Fisherman, camp, butchering, tent, etc.) has contributed to increase students' motivation. Moreover, these strategies mobilize cognitive processes involving reasoning and manipulation concerning the meaning of words being learned. According to the levels of processing theory (Craik and Lockhart, 1972), such activities bring about deep processing of information about the subject being studied. The results of this study corroborate the notion that deep processing facilitates learning and memorization of new information and maximizes its later recall.

It also appears that the students in the experimental group had greater success using the word card strategy compared to the other two strategies (word network and word family). This can be explained by the fact that, the word card was perceived more fun because of the drawing and its playing card shape. Moreover, the word card uses many mnemotechnic strategies like drawing, collocation, definition, personal sentence, and translation. The results show that although the students in the experimental group used the word family strategy better after the three-week intervention, it remains the least successful of the three strategies. The word family strategy requires responsive and relational knowledge of derivational morphology. The task on the test consisted of asking the students to guess the meaning of an unknown derivative word such as *transporter* (transport), *préparatifs* (preparations), or *serviable* (helpful). Then, the person administering the test observed whether the students recognized the word's morphemes (receptive knowledge) and whether they identified affixes and used them to guess the meaning of the unknown word (relational knowledge). The results achieved after the three-week intervention indicates that the students' knowledge was more on the receptive level than the relational level, as the majority of students succeeded in identifying the root word but were not able to explain how the affix changes the meaning of the word. These results support theories of language development asserting that receptive knowledge is a precondition of relational knowledge (Roy & Labelle, 2007). In addition, they indicate that relational knowledge in a second language develops after 4 years of age, as suggested by Daviault (2012). This confirms the observations of the teachers concerning the difficulties encountered when implementing the word family strategy in their classes: "The students still [after three weeks] have difficulty making the connection between the prefix-suffix and the word family" (teacher). Thus, the time and effort required of the teachers and students appears to vary among the three strategies. For students to do well using the word family strategy, their understanding of affixes should be assessed beforehand to help guide teachers and to better assess student progress.

Another observation deserving further analysis is the overuse of the word family strategy to overcome a lack of vocabulary. Daviault (2012) states that children who have limited vocabularies sometimes overuse morphological derivation to guess the meaning of a word. In the current study, this phenomenon of overuse was found in only one student, who explained the meaning of the word *débrouillard* (resourceful in English) as "there are no clouds" (Student 4USB). This student arrived at this erroneous meaning based on his knowledge of the word *brouillard* (fog) and the prefix *dé-* (de-, indicating the inverse of something). He then used relational skills to try to predict how the prefix *dé-* (de-) changed the meaning of the word *brouillard* (fog), concluding that "de-fog" must imply the absence of clouds. (In fact, the word *débrouillard* is in the same word family as the verb *brouiller*, which means "to scramble or muddle or cloud". Thus, the verb *se débrouiller* means "to sort things out" and *débrouillard* is an adjective or noun describing someone who is able to sort things out, in other words, who is resourceful). For this student and all those using the word family strategy, it would be helpful to develop their ability to check the semantic meaning by using an electronic dictionary in order to improve their relational knowledge.

Our analysis of some of the word networks created during the post-test also reveals the importance of working on categories more, by designing exercises to help students become familiar with

the various types of categories (e.g., word classes, rhyming words, words starting with the same letter, words with related meanings).

As for the word card strategy, Figure 4 illustrates that the teachers and students still need to work on certain concepts – such as the difference between "define" and "give an example." Looking at Figure 4, the teacher might suggest that the student define the word with the help of a dictionary or use the form of the word as presented (*préparatifs*), rather than using its root word (*prépare*). We also noted that very few students wrote down the translation as additional information on their word card. This can be explained in part by the fact that few students know how to write well in their Indigenous language. Another factor may be that, as recorded in the teacher's logbooks, they had not used translations very much in class, because the teachers themselves do not know the students' Indigenous language. We would recommend that the translation always be written or at least discuss (Lado, Baldwin and Lobo, 1967). Another recommendation would be to plan time for reviewing words. To facilitate the memorization of words, Dempster (1987) suggested reviewing new words after a few hours, after a day, after two days, and finally a week later, for three minutes each time. According to Snellings, Van Gelderen, and De Glopper (2004), reviewing lexical units should focus on different aspects such as the meaning, syntax and context of use. Taken together, the results show that the positive effect of teachers' instructional interventions.

Conclusion

The effects of the explicit teaching of the three strategies described in this article proved to be quite unambiguous. The results demonstrate the clear benefits of explicit teaching of word family, word network and word card strategies to students in the third grade. The appropriation of the strategies by elementary Indigenous students coming from economically disadvantages environment and limited vocabulary background encourages sustaining this vocabulary strategic teaching intervention. On the other hand, further research would be useful to determine whether implementing these strategies can have such positive effects for elementary school students on vocabulary acquisition. Another limitation of this study concerns the duration of the experimental intervention. The impact of teaching the three strategies would have been more representative if the students had practiced over a longer period.

In terms of pedagogical recommendations, the author suggests that the time and effort required of the teachers and students should vary depending on the strategy. For example, more time and preparation should be devoted to the word family strategy than to the other two strategies. It is also important to plan for preparatory and/or complementary activities in order to provide students with the necessary tools prior to undertaking use of the three strategies. For the word family strategy, for example, teachers should plan on presenting materials and exercises to familiarize students with the most common prefixes and suffixes and their respective meanings. To prepare students to use the word network strategy, teachers should plan activities to familiarize students with a wide range of categories. For the word card strategy, students need to understand how to define a word. Finally, it would be useful to improve the procedures for teaching the word card, word network and word family strategies by including electronic dictionaries and mobile technologies to add pictures and vocal data include relevant students' references. These three strategies are a good way to add on to reading, especially for students coming from low economical environment background. Strategic vocabulary teaching helps students to have more resources when facing unknown words.

Acknowledgements

References

AUTHOR & Le, T.H. (2014).

AUTHOR & Le, T.H. (2013).

AUTHOR & Le, T.H. (2013b).

Aitchison, J. (2012). *Words in the mind: An introduction to the mental lexicon.* Hoboken, NJ: Wiley-Blackwell.

Anglin, J. M. (1993). Vocabulary developpement: A morphological analysis. *Monographs of the Society for Research in Child Developpement*, 58(10), 1-166.

Barnhardt, R., & Kawagley, A. O. (2005). Indigenous knowledge systems and Alaska ways of knowing. *Anthropology and Educational Quarterly*, *35*(1), 8-23.

Bertram, R., Laine, M. & Virkkala, M. M. (2000). The role of derivational morphology in vocabulary acquisition: Get by with a little help from my morpheme friends. *Scandinavian Journal of Psychology*, *41*(4), 287-296.

Biemiller, A., & Boote C. (2006). An effective method for building meaning vocabulary in primary grades. *Journal of Educational Psychology*, *98*(1), 44-62.

Burns, M. K., Griffiths, A., Parson, L. B., Tilly, W. D., & VanDerHayden, A. (2007). *Response to intervention: Research for practice*. Alexandria, VA: National Association of State Directors of Special Education.

Chialant, D., & Caramazza, A. (1995). Where is morphology and how is it processed ? The case of written word reconition. In L. Feldman (dir.), *Morphological aspects of language processing*. Hillsdale, NJ: Erlbaum.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. Mahwah, NJ: Lawrence Erlbaum.

Craik, F. I. M., & Lockhart, R. S. (1972). Levels of processing: a frame-work for memory research. *Journal of Verbal Learning and Verbal Behavior*, *11*, 671-684.

Daviault, (2012). *L'émergence et le développement du langage chez l'enfant*. Montréal, Qc: Chenelière.

Dempster, F. N. (1987). Effects of variable encoding and spaced presentation on vocabulary learning. *Journal of Educational Psychology*, *79*, 162-170.

Graves, M. F. (2009). *Teaching individual words. One size does not fit all.* Newark, NJ: International Reading Association.

Hart, B., & Risley, T. R. (2003). The Early Catastrophe. The 30 Million Word Gap. *American Educator, 27*(1), 4-9.

Kimble, G. A., Craik, F. I. & Tulving, E. (1975). Depth of processing and the retention of words in episodic memory. *Journal of Experimental Psychology: General, 104*(3), 268-294.

Kitchen, J., et al. (2011). Developing capacity in Indigenous education: Attending to the voices

of Aboriginal teachers. *Action in Teacher Education*, *33*(1), 615-627.

Lado, R., Baldwin, B., & Lobo, F. (1967). *Massive vocabulary expansion in a foreign language beyond the basic course: the effect of stimuli, timing and order of presentation* (pp. 5-1095). Washington, DC: Us Departement of Health, Education and Welfare.

Laufer, B., & Shmueli, K. (1997). Memorizing new words: Does teaching have anything to do with it?. *RELC Journal*, *28*, 89-108.

Nation, I. S. P. (2001). *Learning vocabulary in another language*. New York, NY: Cambridge University Press.

Paivio, A. (1971). *Imagery and verbal processes*. New York: Holt, Rinehart & Winston.

Paivio, A. & Desrochers, A. (1981). Mnemonic techniques in second-language learning. *Journal of Educational Psychology, 73*(6), 780-795.

Roy, C. & Labelle, M. (2007). Connaissance de la morphologie dérivationnelle chez les francophones et non-francophones de 6 à 8 ans. *Revue de l'Association canadienne de linguistique appliquée, 10*(3), 263-292.

Simard, C., & Chartrand, S. G. (2011). *Grammaire de base.* Saint-Laurent, Canada: Éditions du renouveau pédagogique.

Snellings, P., Van Gelderen, A., & De Glopper, K. (2004). The effect of enhanced lexical retrieval on second language writing: A classroom experiment. *Applied Psycholinguistics*, *25*(2), 175-200.

Standing, L. (1973). Learning 10,000 pictures. *Quartely Journal of Experimental Psychology*, 25, 207-222.

Tabachnick, B. G., & Fidell, l. S. (2007). *Using multivariate statistics (5th ed.)*. Boston: Allyn and Bacon

Tremblay, O. (2009). *Création d'une ontologie des connaissances métalexicales pour l'élaboration d'un module de cours en didactique du lexique destiné aux futurs maîtres au primaire en français langue maternelle.* Thèse de doctorat non publiée, Université de Montréal, Montréal, QC.

Tréville, M. C. (2000). *Vocabulaire et apprentissage d'une langue seconde : recherches et théorie*. Montréal, Canada: Éditions Logiques.

Tréville, M. C., & Duquette, L. (1996). *Enseigner le vocabulaire en classe de langue*. Vanves, France: Hachette.

Tyler, A. & Nagy, W. (1989). The acquisition of English derivational morphology. *Journal of Memory and Language, 28*, 649-667.

Appendix A
List of words used to perform the three tasks in the pre-test and post-test

l'outarde, le pêcheur, le caribou, les préparatifs, le dépeçage, le poteau, la tranche, paisiblement, serviable, débrouillard, fendre, transporter, étirer, camper, chasser (the goose, the fisherman, the caribou, preparations, butchering, the post, the slice, peacefully, helpful, resourceful, split, transport, stretch, camp, hunt)