

Article

Re-Thinking the Principles of (Vocabulary) Learning and Their Applications

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Abstract: Making vocabulary stick in your memory involves dedicating attention to what needs to be learned. There are three main factors involved (focus, quantity, and quality) which can be expressed as six principles (focus, accuracy, repetition, time-on-task, elaboration, and analysis). When we include motivation in this description, then there are two more principles (motivation and self-efficacy). These principles apply to both incidental and deliberate learning, and apply to a wide range of learning focuses beyond vocabulary. These principles are well supported by research evidence. We can use the principles for re-examining teaching and learning, Technique Feature Analysis, understanding research, developing autonomy in learning, guiding curriculum design, and determining future research needs. The factors and principles provide a simple and clear view of what is needed for learning to occur from the viewpoint of attention.

Keywords: memory; repetition; vocabulary learning; attention; motivation; principles of learning; spaced retrieval; elaboration; analysis

1. Learning Vocabulary

How do we make the form and the linked meaning of a word stay in our memory? There are plenty of well-proven answers to this question, and they include advice such as focus deliberately on the word, repeat the learning at least six or seven times and preferably more, practice spaced retrieval, use a mnemonic trick such as the keyword technique, word part analysis, or considering the fit of form and meaning, write the word, and so on. This is all excellent advice that has been proven to work in particular circumstances. However, these well-proven answers put a small number of very basic principles into practice. It is useful to be aware of what these principles are because knowing them can affect how well we apply them and how widely we can apply them. The principles are surprisingly simple and involve common-sense. The framework in Figure 1 presented below suggests that if we want to learn vocabulary, we need to focus on what we want to learn (focus of attention), we need to spend time focusing on what we want to learn (quantity of attention), and we can improve learning by increasing the quality of attention to what we want to learn. Each of these three aspects of attention is on a scale, and the three aspects are very closely bound to each other. There is another aspect of a different kind that affects attention and that is motivation. Motivation affects all three of the other aspects, and in Figure 1 motivation is represented by the box around the triangle.

The three small triangles represent the cognitive requirements of attention that affect learning. The thick lines joining the triangles show that each requirement of attention is necessarily connected to the other aspects. A small triangle is used to represent each requirement to show that each requirement involves a ranked cline of levels of effectiveness, from the point to the base. Focus, quantity, and quality are strongly linked to each other because to learn something there has to be something to learn (the focus), and if we attend to it, we give it some degree of quantity of attention, and this attention has some degree of quality. Because of these strong links, there is some arbitrariness in assigning applications



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to each requirement. For example, retrieval, deliberate learning, and the spacing of learning could be seen as quality features rather than quantity features, although in my discussion below, they are included in quantity. Similarly, focusing attention on a particular aspect of language use could be seen as a focus feature or as a quantity feature.

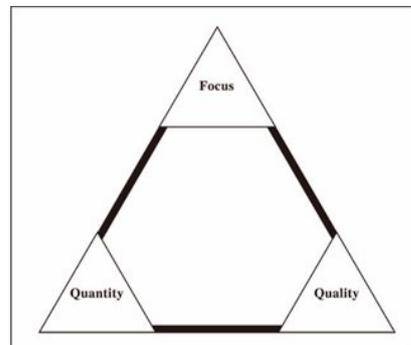


Figure 1. The aspects of attention.

As the reviewers of this paper noted, the ideas dealt with here are very much a work in progress. Publishing the paper now is in several ways premature, but at my age, you do not leave things until tomorrow. I feel sure that some of the ideas will change as I continue to try to apply them to recent research and over-looked research, and apply them from other viewpoints. However, I do feel that there is value in the reductionist and somewhat simplistic approach I have taken. Many of the ideas covered here are complex, but I think the complexity rises from the combination of principles and the circumstances of their application rather than from more complex principles I have not included. I feel the true test of the paper may be seeing if there are principles that have not been included that cannot be made from the combination of the principles I have described here.

1.1. Focus

The cline of effectiveness for focus is based on the degree to which the focus is on what really needs to be learned without distraction or error. The focus can be directed towards various aspects of form, meaning, and function (see [Nation 2022](#), Table 2.1), and towards the knowledge components of breadth, depth, strength, and integration of vocabulary knowledge ([Nation 2022](#), chap. 2). The focus of attention is strong if the focus is on features or skills that transfer directly to language use (relevance) and if what is focused on is clear, comprehensible, and accurate (accuracy).

1.2. Quantity

Quantity of attention involves the amount of repetition and the sustaining of attention through time-on-task. Repetition most obviously relates to the number of occurrences of vocabulary or multiword units. However, it also applies more widely to grammatical features and to skill and sub-skill development in listening, speaking, reading, and writing. The more you read, the better you become at reading through repetition of the skill and sub-skills. The cline of levels of effectiveness is quantitative, based solely on the amount of repetition and the amount of attention given. The more repetition and attention, the more likely the learning is to be retained. Repetition takes account of the gradual decay of learning, with spaced repetition re-strengthening partly decayed knowledge as well as adding to the quantity of attention given to an item.

1.3. Quality

Quality of attention involves enriching knowledge through linking present learning to existing knowledge and through increasing knowledge of different aspects of an item and different parts of aspects. As [Lindstromberg \(2020, p. 243\)](#) notes when discussing retrieval, “what matters is not retrieval in and of itself but rather the processing that goes

on during the search for the response and the processing that goes on after the response becomes available." The cline of levels of effectiveness is qualitative, based on the number and distinctiveness of the different aspects of what it means to know a word.

These three aspects of attention and one of motivation can be expressed as eight principles, with two for each aspect. The principles described here apply equally to incidental learning and deliberate learning. The difference between incidental and deliberate learning is simply in the degree to which each principle is applied, that is, in the position on the cline involved with each aspect. That means that deliberate learning involves stronger application of the principles, increasing their effectiveness. Incidental learning involves the same principles, but they are not so strongly applied. For example, deliberate learning of vocabulary using flash cards involves a large amount of focused attention. Incidental learning through extensive reading also involves quantity of attention but not with the same amount of attention as when using flash cards.

2. The Principles of Learning

2.1. Motivation Principles (Engagement)

For learning to occur there needs to be a willingness to focus on what needs to be learned, and to give it quantity and quality of attention.

1. Motivation: The degree of engagement with the task affects the likelihood of learning occurring.
2. Self-efficacy: Our confidence in our own skills of learning affects our success in learning.

2.2. Focus Principles (Usefulness)

Learning requires giving attention to what needs to be learned.

3. Focus: We learn what we focus on, and in addition, our learning is more useful if it closely resembles the use that we need to make of what we learn (transfer-appropriate).
4. Accuracy: Our learning is more efficient if the information we are focusing on is complete, accurate, and comprehensible. Vocabulary control, easy multiple-choice glosses that are unlikely to lead to error, and teach and test are some ways of ensuring this.

2.3. Quantity Principles (Amount)

The greater and longer the attention, the stronger the learning.

5. Repetition: The more repetition, the stronger the learning.
6. Time-on-task: Quantity of attention is increased by desirable difficulty, also called the deficient processing account. Spacing, expanding spacing, the lag effect (greater spacing rather than shorter spacing), retrieval, deliberate attention, testing (rather than re-studying), multiple-choice glosses, interleaving, production, form recall vs. meaning recall, and variation ensure a greater amount of attention and a better quality of attention resulting in better long-term retention.

2.4. Quality Principles (Connections)

Elaboration and analysis increase and strengthen connections between the item to be learned and other knowledge, making it easier to access the item. Note the overlap between quantity and quality principles, particularly where variation implies repetition. Elaboration is a commonly used term with a variety of meanings. Here, it is used with the meaning of making connections between a vocabulary item and connections outside it. Analysis examines links within the lexical item.

7. Elaboration: This includes enriching the encoding of an item through variation of different modalities (spoken, written, pictorial/visual), through variation in type of use (receptive, productive), through variation of form (meeting different family members,

or different accents), through variation in meaning and reference, through variation in grammatical use, and through embedding in larger language units. Elaboration tends to make links from the word such as to other L2 words (collocations) or to L1 words or pictures or realizations, while analysis tends to look within the word or word group to examine its parts.

8. Analysis: Relating the familiar parts to the unfamiliar whole.

3. Research Evidence

Let us now look at the research evidence for each of the principles.

1 *Motivation*: As [Nation and Waring \(2020\)](#) show with regard to extensive reading, motivation is influenced by a wide range of factors, and there are many kinds of motivation. [Lamb \(2017\)](#) provides an excellent review of how teachers can motivate learners (see [Martin \(2020\)](#) for a response to the article). [Ushioda \(2020\)](#) also takes a very practical approach to motivation. [Dörnyei and Ushioda \(2021\)](#) describe the difficulties in defining motivation, but stress its importance in language learning.

2 *Self-efficacy*: The idea of self-efficacy originated in the work of [Bandura \(1997\)](#). It involves learners' beliefs in their ability to organize and carry out a specific task to achieve certain learning. It is more than just confidence, but involves a belief in one's own autonomy in learning even though the task may be challenging ([Graham 2022](#)). There are many factors affecting the development of self-efficacy, but [Usher and Pajares \(2008\)](#) concluded that successfully completing challenging tasks was one of the most important. Self-efficacy and language learning strategies are closely related ([Kim et al. 2015](#)), because skill and confidence in strategy use affect whether learners will persist in their learning even though the task is challenging. This principle is a useful one to have in the list because it targets autonomy in learning as a useful goal in a language course. This principle is supported by research on autonomy, language learning strategies, and self-efficacy in foreign language learning.

3 *Focus*: The research supporting this principle includes [Barcroft's \(2015\)](#) research on Type of Processing Resource Allocation (TOPRA), and [Morris et al.' \(1977\)](#) transfer-appropriate learning.

One of the implications of the TOPRA model is that the semantic processing of words, as in extensive reading, can take attention and processing resources away from the learning of word forms. On the other hand, giving attention to word forms (structural processing) will help in the learning of word forms. A large number of studies have provided support for this idea ([Barcroft 2002, 2003, 2004, 2006, 2009](#); [Kida 2022](#); [Kida and Barcroft 2018](#); [Wang and Pellicer-Sánchez 2022](#)). The idea behind TOPRA is that individuals' processing capacity is limited and if they give attention to a particular language feature, this will take attention away from other features. For example, if they pay attention to meaning in context, they take attention away from learning word forms. [Elgort et al. \(2018\)](#) found similar effects when using word writing to give attention to form. [Wang and Pellicer-Sánchez \(2022\)](#) found that bilingual subtitles were not as effective as captions for word form learning, because the L1 translation took attention away from the word form (see also [Peters 2019](#)). The implication of the focus principle for learning is that learners need to be aware of what aspect of vocabulary learning they need to focus on and make sure that they provide opportunities for that learning to occur. This means for example that when conducting extensive reading, learners note unfamiliar words for later deliberate study. [Wi and Boers \(2024\)](#) show the advantage of sequential processing of the same words more than once so that different aspects of knowledge can receive attention.

When examining research on the levels of processing hypothesis, [Morris et al. \(1977\)](#) found that the effectiveness of a particular treatment depended on the measure used to measure its effectiveness. If the measure bore little relationship to the treatment, then of course the effect of the treatment was weak. If the measure resembled the treatment or matched the goals of the treatment, then the effect was strong. The same applies to learning for language use. If the learning resembles the use the learners need to make of the

language, then the learning will result in improved language use. While proficiency in one language skill, for example reading, can support proficiency in a related skill, writing, the greatest support for the use of a skill will come from practice in that skill. This is probably the strongest criticism of the comprehensible input hypothesis. Namely, you will become much better at writing or listening if you practice writing or listening than if you do not practice writing or listening and just practice reading.

4 Accuracy: The research supporting this principle includes research on trial-and-error vs. informed retrieval, and research on glossing. [Elgort et al. \(2020\)](#) found that trial-and-error guessing from context worked better for learning word meaning than an errorless treatment where the meaning was provided before reading, but in both treatments, learners were given feedback on the correct meaning. Providing a correct answer may overcome the effects of error during trial-and-error. [Boers et al. \(2017\)](#) concluded that collocation activities should minimize error rates and should present complete collocations rather than parts to join together. [Strong and Boers \(2019\)](#) found that around 25% of learners' incorrect responses to collocation activities were reproduced in the delayed post-test. The vast majority of the textbooks that they examined provided no previous instruction to guide the learners in the exercises they included, meaning that learners had to rely on trial-and-error and later feedback. Trial-and-error may be fine if the learners are highly likely to generate the correct answer or if there is feedback that quickly deals with any errors because what we learn needs to be accurate.

Studies of glossing show that providing a meaning for a word results in better learning than guessing without feedback. [Yanagisawa et al. \(2020\)](#) show that being able to access a correct comprehensible meaning for a word results in more vocabulary learning than unsupported guessing from context. L1 glosses are more effective than L2 glosses, presumably because they are more comprehensible.

5 Repetition: There is a very large amount of research showing the positive effects of repetition on learning ([Kida 2022](#); [Laufer and Rozovski-Roitblat 2015](#); [Pellicer-Sánchez and Schmitt 2010](#); [Uchihara et al. 2019](#); [Waring and Takaki 2003](#)). The general finding is that the more repetitions there are, the more likely and stronger the learning will be. However, the relationship between repetition and learning is of medium strength rather than a very strong relationship, because there are many factors affecting vocabulary learning. Nonetheless, it is a very robust relationship. There is a persistent finding that being able to recognize or recall a word meaning requires more repetitions than developing receptive familiarity with a word form ([Pellicer-Sánchez 2020](#); [Waring and Takaki 2003](#)). Developing collocational information and knowledge of word parts requires even more repetitions.

6 Time-on-task: The research supporting this principle includes research on time-on-task ([Folse 2006](#); [Hill and Laufer 2003](#)), fluency development ([Beglar et al. 2012](#); [Chung and Nation 2006](#)), eye-tracking ([Montero Perez et al. 2015](#); [Pellicer-Sánchez 2016](#); [Wang and Pellicer-Sánchez 2022](#)), desirable difficulty ([Bjork and Kroll 2015](#)), incidental vs. deliberate learning ([Lindstromberg 2020](#); [Webb 2020](#)), deliberate attention ([Laufer and Rozovski-Roitblat 2015](#)), and the spacing of learning ([Underwood 1961](#)). [Beglar et al. \(2012\)](#) found that the learners who made the most reading fluency gains were learners who read the most material at the right level for them, rather than the learners who simply read the most material. This finding thus also provides support for Principle 3 which involves transfer-appropriate learning. The more fluent reading that you carry out, the more fluent you become. In an eye-tracking study using bilingual subtitles, [Wang and Pellicer-Sánchez \(2022\)](#) found that the amount of time spent looking at the English word form in the subtitles predicted word contributed to learning gains. Attention to the L1 translations in the bilingual subtitles took time away from giving attention to the L2 form, but assisted word meaning recall. There is evidence that spacing the retrievals increases the amount of time spent on each retrieval ([Godfroid et al. 2018](#); [Koval 2019](#)). [Laufer and Rozovski-Roitblat \(2015\)](#) found, as have many other studies reviewed by them, that adding a deliberate learning element greatly increases learning. Adding a deliberate element to a task also increases the time spent on the task, particularly compared to incidental learning. [Laufer](#)

and Rozovski-Roitblat (2015), however, compared the effects of quantity and quality. They concluded that “what learners do with the word may be more important than how many times they encounter it.” (p. 687), indicating that the principles of elaboration and analysis have an important role to play in learning.

7 Elaboration: The research supporting this principle includes research on the levels of processing theory (Craig and Lockhart 1972), varied use (Joe 1998), dual coding (D’Agostino et al. 1977; Paivio 1990), the keyword technique (Pressley 1977), and etymological elaboration (Boers et al. 2007). Craig and Lockhart suggested that the only thing that mattered in learning was what occurred in the brain at the moment of learning. If what occurred was deep and thoughtful, then the learning would last. If the processing was shallow, it would not last. This theory has come under a lot of well-deserved criticism, particularly regarding how to define deep and shallow, but the point it makes is correct—the quality of processing affects retention.

Joe (1998) examined the effects of recall on learning, finding that varied recall resulted in stronger learning. Varied recall involved the learner recalling an item in a different form or meaning from which it was initially met. This variation could involve a different morphological form, a slightly different sentence context, a slight stretching of the meaning, and so on. Joe found it necessary to develop a scale of variability to classify the variations produced.

In typical receptive language use, meetings with the same word typically occur in different contexts. The occurrence of different family members from the same family, such as *involving* and *involvement*, is likely to result in stronger learning than exactly the same family member occurring again, underlining the importance of including attention to word families and word part analysis in a language course.

Paivio (1990) proposed that a critical factor affecting learning was the coding of information in two ways—a language-based (verbal) representation and non-verbal imagery. The two kinds of representation are separate systems, but they are functionally interconnected. The connections between the two systems improve the quality of processing and thus help memory.

The keyword technique is a memory trick for learning vocabulary that uses linguistic and visual information. It is the most researched mnemonic device for learning vocabulary with well over sixty research studies focusing on it. The research is reviewed in Nation (2022) and Boers (2021). The technique involves finding a first language keyword that sounds like the beginning or all of a foreign language word that needs to be learned. For example, for learning the English word *cow*, the L1 Thai word *khaw* meaning “rice” could be used. The next step is to create a visual image involving the interaction of the meanings of the two words, for example a cow eating rice, or a cow sitting on a pile of rice. The keyword technique thus involves a form link (the sounds of the two words) and a meaning imagery link. The keyword technique typically produces results around 20%-25% better than rote learning. Its effectiveness depends on it being used properly (Boers 2021, pp. 176–81) in line with the principles of learning described here.

Etymological elaboration applies to the learning of multiword units and figurative expressions (Boers et al. 2007), and there is a large amount of research showing the effectiveness of learning about the origin of expressions such as *the ball is in your court* as a way of helping them stick in memory. Such elaboration can apply to single words and multiword units with the learning of a word such as *trust* being related to *true*, *tree*, and *trunk*. Boers and colleagues’ research has also shown the effect of phonological repetition such as alliteration, rhyme, and euphony in helping retain the form of phrases (Boers 2020). Similarly, when mapping the form–meaning link, encouraging the learners to consider the appropriateness of the link (does the form of this word fit its meaning?) helps in learning the link (Deconinck et al. 2017), as a result of cross-linguistic associations, or what the authors call “sound symbolic resonance”.

It is important to note that the principle of elaboration works in conjunction with the other principles. What is elaborated needs to relate to the focus of learning, needs to be accurate, and needs quantity of attention.

8 *Analysis*: The research supporting this principle includes word part analysis (Wei 2015) and longitudinal and multi-aspect studies of vocabulary depth (Pigada and Schmitt 2006). There are systems that lie behind the various aspects of knowing a word. These systems include sequences of sounds, spelling rules, word parts, form–meaning connections, the shared underlying meaning of various uses of a word, the patterning of multiword units, and grammatical patterns. Seeing how particular items relate to these systems helps learning by relating familiar knowledge to new knowledge.

This reconceptualization of what we already know has several practical applications, namely for teaching and learning, Technique Feature Analysis, understanding, explaining and predicting research findings, developing learner autonomy, and directing future research. The following part of the paper is an attempt to check out whether this re-thinking has any noticeable effect on these applications or if it is just shuffling ideas around.

Application 1: Applying the principles to teaching and learning

Table 1 relates the eight principles to their applications in learning. The guidelines such as using retrieval, spaced repetition, visualization, and using mnemonics that have typically been used to enhance learning still apply. The difference is that now it is easier to see why these guidelines are relevant, and how they should be applied. Having knowledge of why the guidelines work can ensure that the guidelines are used well. For example, when conducting flash card learning, knowing that what you focus on is what you are most likely to learn can help a learner decide if they should say the words aloud, write them, or even close their eyes and visualize the word form before retrieving the meaning. It should also make them aware that when the words on the cards are getting easier after several repetitions, it is still worth dwelling on them rather than rushing through. The applications described in column 2 are given as very direct statements for the sake of clarity. However, they need to be applied with a little more nuance. For example, for Principle 4 *Use dictionaries and glossaries*, the glossaries and dictionaries should be comprehensible, either using L1 explanations or explanations in a controlled vocabulary. Similarly, *Don't use trial-and-error* can be qualified by saying “unless the chance of error is very small”. Typically, the things to be careful about involve the application of principles which are in the list of eight.

Table 1. Principles and their applications for vocabulary learning.

Principle	Application in Techniques
1 <i>Motivation</i>	Learn obviously useful words Set challenging but achievable goals Use puzzle-like and test-like tasks Record successful learning using graphs
2 <i>Self-efficacy</i>	Use vocabulary control in listening and reading materials Do pre-study training Work with small numbers of words
3 <i>Focus</i>	Understand what is involved in understanding a word Have a clear vocabulary learning goal Supplement incidental learning with deliberate learning
4 <i>Accuracy</i>	Do not use trial-and-error, use study and test Use comprehensible dictionaries or glossaries Use L1 meanings

Table 1. Cont.

Principle	Application in Techniques
5 Repetition	Use peer testing Use related tasks that recycle the same content Encourage large quantities of graded reading and listening Encourage opportunities for negotiation of meaning Revisit the same material several times
6 Time-on-task	Use spaced retrieval Use self-testing Use larger groups of cards as skill at learning increases
7 Elaboration	Find members of the same word family Look for the core meaning of various senses Learn words with their known collocations Conduct plenty of extensive reading to see examples of use Focus on both written and spoken forms Say or write the words, preferably using retrieval Visualise examples of use Use the words Use pictures of the meaning as well as translations Practice receptive and productive learning, that is looking at the word and recalling its meaning, and looking at the meaning and recalling the word form Consider the fit of form and meaning Look for cross-linguistic associations
8 Analysis	Learn to use the keyword technique Learn word parts and learn to recognize them in words Do multiword unit analysis Consider the origins of figurative expressions Use analogy or patterning of form, meaning, and use. For example, look at spelling regularities and irregularities, look for a shared meaning among various uses, look for similarities among collocates

As Bjork et al. (2013) note, learners and teachers are often not good judges in deciding on the success of their learning. This unsuccessful estimation typically occurs because a short-term gain does not necessarily result in a long-term gain, or because initial difficulty may actually help long-term retention. Relying on the application of principles makes the use and adaptation of learning activities more effective than simply relying on intuition.

The relationship of a task to previous learning strongly affects the way the task contributes to learning. For example, verbatim repetition is likely to contribute less than varied repetition. Note also that analysis and elaboration enrich knowledge of the item and also increase the amount of time focused on an item.

Application 2: Revised Technique Feature Analysis

Technique Feature Analysis (Nation and Webb 2011) is a more elaborated form of the Involvement Load Hypothesis (Laufer and Hulstijn 2001). It was created because the Involvement Load Hypothesis does not include several conditions that have been proven to help vocabulary learning, such as varied use, repetition, spacing, and analysis. Technique Feature Analysis tries to predict the effectiveness of a vocabulary learning activity by analysing how well the activity involves established principles of learning. Reconceptualizing the principles of learning thus necessitates reconceptualizing Technique Feature Analysis. The result of this reconceptualization is that there are now 16 questions instead of 18. The deleted features are “Awareness of new vocabulary learning” (because it is covered under “Focus attention on what we need to learn”), and “Negotiation” (because it is covered under “Varied meetings and use”). The headings in Figure 2 match the four parts of Figure 1—motivation, focus, quantity, and quality.

Motivation
<i>Are the learners likely to be successful in completing the activity?</i>
Does the activity motivate <i>attention or engagement</i> ?
Do the learners select the words?
Focus
Does the activity focus attention on <i>what we need to learn</i> ?
Is the learning <i>transfer-appropriate</i> ?
Is the information <i>accurate and comprehensible</i> ?
Quantity
Does the activity involve retrieval of the meaning <i>or substantial attention to the meaning</i> ?
Does the activity involve retrieval of the word form or substantial attention to the word form?
Is it recall rather than recognition?
Are there multiple meetings or retrievals of each word?
Is there spacing <i>of at least several minutes</i> between meetings or retrievals?
Quality
Does the activity involve varied meetings or use?
Is there a substantial change from previous meetings?
<i>Does the activity involve analysis or analogy?</i>
Does the activity involve instantiation or imaging?
Does the activity avoid interference?
Total score/16

Figure 2. Technique feature analysis. *Italics* = new additions.

The following comments refer to the questions in the table. *Does the activity motivate attention or engagement* can include interest in a story. *Do the learners select the words* could include deciding which words to look up. *Does the activity involve varied meetings or use* can include variation from previous meetings or within the activity itself as with varied word forms, collocations, contexts. *Is there substantial change from previous meetings* probably needs a two- or three-point scaled list, as in Joe (1998). One or two other criteria might benefit from being a scale rather than being just yes/no. Multiple meetings could be scaled on the number of repetitions. Length of spacing could be scaled on length of time. Does the activity motivate attention could also be scaled.

Here is an example of applying the questions using the keyword technique. The keyword technique would be scored two out of three for motivation if the learners are well trained in its use (the activity is not self-motivating). It would be scored two out of three for focus (It is not transfer-appropriate). It would be scored two out of five for Quantity (It is recognition not recall. It does not involve repetition or spacing). It would be scored three out of five for quality (It does not involve variation or substantial change). It would have a total of 9 out of 16, a rather harsh score perhaps.

Applying the re-thinking to Technique Feature Analysis results in several important deletions, additions, and adjustments. It needs further adjustments to preserve its yes/no nature.

Application 3: Understanding and predicting research findings

The motivation for the writing of this paper came from my rather arrogant belief that if you showed me the treatment and measurement sections of a piece of vocabulary research, I could successfully predict what the results would be. This interest partly arose from reading papers where time-on-task was not controlled for and studies comparing incidental and deliberate learning. I was going to give the paper the tongue-in-cheek title of *Do we need more research?*, working on the idea that if we could predict results from already well-proven principles, then we should be researching areas where we do not know what the results will be. I started testing myself out on papers where I knew the result and then

on experiments and meta-analyses where I deliberately avoided looking at the results. I found my predictions were largely correct.

Such prediction is a form of Technique Feature Analysis, where a technique is given a score on the basis of meeting several learning criteria. When analysing an experiment, the analysis is made quite a bit easier by having a comparison with a control group to highlight the critical part of the treatment. In most research, we tend to work the other way. We look at the results, and then in the discussion section we explain the results by relating them to principles and previous research. Some pieces of research make predictions before gathering the data. I found I was quite good at predicting the result, and that made me look again at what principles of learning I was drawing on to make the prediction. Being able to make the predictions also made me consider whether we were doing too much research in areas where there were few new things to learn, and not enough research involving brave questions where the answers are truly unknown. Such brave research, where we do not know the answers, includes the development of implicit vocabulary knowledge, the effect of fluency development activities on collocational knowledge, the growth of L1 vocabulary knowledge during tertiary study and in employment, the growth of L2 word family knowledge, and the effect of extensive reading on knowledge of grammar.

Understanding the principles also helps us make sense of the research we read. If when reading we can compare what we read with what we already know about learning, such as the principles described here, then our reading will be more informed and more critical.

Application 4: Learner autonomy

Learning how to learn is neglected in many language courses, and certainly in most published language courses. However, learning a language is such a large undertaking that it necessarily requires learners to take control of their own learning because coursebooks and teachers cannot possibly cover all that needs to be learned, and much of the learning involved is beyond the influence of direct teaching and study. Learners need to know how to learn.

The framework and principles described in this paper are not difficult to understand, and they require only a small amount of learning. When training learners in how to learn, there is value in having a simple clear memorable framework that they can follow. Figure 1 fulfils these requirements. Learning how to learn includes understanding the principles behind learning.

A useful way to learn the principles would be to analyse applications, such as those in Table 1, using the principles, and to improve learning procedures using the principles. The principles apply well beyond vocabulary learning.

Application 5: The principles of course design

How does re-thinking the principles of learning affect the wider set of principles of course design? Macalister and Nation (2020) present 20 principles of course design organised under the three headings of content and sequencing, format and presentation, and monitoring and assessment.

The learning principles not obviously covered in the larger set of principles of course design are the focus principles of focus and accuracy. It could be argued that the format and presentation principles of the four strands and the related principles of comprehensible input, fluency, output, and deliberate learning to some degree cover focus in that they deal with transfer-appropriate learning through input, output, and fluency development, and that deliberate learning involves deliberate focus, but this obscures the focus principle which emphasizes that we need to focus on what we need to learn. The accuracy principle is completely missing from the original list of curriculum design principles.

An improved list of curriculum design principles would look like this (Table 2), with omissions to keep the list to 20 principles.

Table 2. The adjusted list of principles of curriculum design.

Principles of Course Design	Principles Removed or Reformed
Content and sequencing	
Cost/benefit	
<i>Focus</i>	
<i>Self-efficacy</i>	Frequency
<i>Accuracy</i>	Strategies and autonomy
<i>Repetition</i>	Spaced repeated retrieval
Language system	
Keep moving forward	
Learning burden	
Interference	
Format and presentation	
<i>Motivation</i>	
Four strands	
Comprehensible input	
Fluency	Depth of processing
Output	
Deliberate learning	
<i>Time-on-task</i>	
<i>Elaboration</i>	
<i>Analysis</i>	
Monitoring and assessment	
Ongoing needs and environment analysis	
Feedback	

The eight principles of learning are in italics.

The principles of teachability, integrative motivation, and learning preferences have been removed from the list of curriculum design principles, partly because research has not strongly supported their inclusion. A further content principle to consider including is part of a revision of the four strands principle (Nation 2017), namely integrated content, though this could be considered as part of the four strands principle. Rethinking the principles of learning has a substantial effect on around one-third of the twenty principles of curriculum design with three deletions, three additions, and four re-namings and reformings.

Application 6: Future research

While we know a lot about quantity of attention, we know less about quality of attention and what it contributes beyond quantity. How do analysis and elaboration enhance learning? In what ways does the research on word association have application to elaboration? Does long-term storage result in more secure storage without further quantity or quality of attention needed? Do the principles apply to grammar? Quality of attention as described in this paper seems to have little relevance to the subconscious learning of grammar, except perhaps for grammatical features that have parallels in the L1. It may also have little relevance to the advanced learning of vocabulary when core meanings which are different from L1 translations are established. We know little about the development or word meaning in an L2. It is likely that the way we develop concepts in our L1 will be similar to the way advanced learners develop concepts in their L2.

4. Problems

According to this framework, if the quantity of attention is truly the same between massed learning and spaced learning, then the learning will be the same, both for short-term and long-term retention. I feel this is probably not right. Research on topics such as the effect of sleep on learning suggests that qualitative changes can occur between spaced repetitions (Dumay and Gaskell 2007), particularly in the integration of new knowledge into existing knowledge.

Using Technique Feature Analysis still requires a lot of judgement to be made in answering the questions. Considerable training may be needed to encourage raters to agree on analyses.

5. Reflections

This paper has not focused on new research but has looked at re-thinking what we already know. This re-thinking has resulted in some notable changes to Technique Feature Analysis and the principles of curriculum design, and an easily remembered mnemonic diagram for learner training. It has not resulted in much change to the way we view and explain teaching and learning activities because re-thinking the principles does not change the existing already useful and well-proven guidelines for learning. The re-thinking does affect the way we interpret and explain research findings, because research often aims to provide new guidelines. The simple framework makes explaining and predicting findings clearer because there is now a smaller number of factors to consider. Overall, I consider the re-thinking has enough positive practical outcomes to have made it worthwhile.

This re-thinking of the principles of learning has resulted in a book on the twenty most effective language teaching techniques (Nation 2024). This book involves an evaluation of very commonly used language teaching techniques and involves considering how well they apply the principles of learning and how they should be used to make sure that they make the best application of the principles. As this article suggests, there is a small number of principles of language learning that can be applied to a large number of teaching and learning procedures, and to analysing, applying, and researching these procedures.

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References

- Bandura, Albert. 1997. *Self-Efficacy: The Exercise of Control*. Dallas: Freeman.
- Barcroft, Joe. 2002. Semantic and structural elaboration in L2 lexical acquisition. *Language Learning* 52: 323–63. [CrossRef]
- Barcroft, Joe. 2003. Effects of questions about word meaning during L2 Spanish lexical learning. *Modern Language Journal* 87: 546–61. [CrossRef]
- Barcroft, Joe. 2004. Effects of sentence writing in second language lexical acquisition. *Second Language Research* 20: 303–34. [CrossRef]
- Barcroft, Joe. 2006. Can writing a word detract from learning it? More negative effects of forced output during vocabulary learning. *Second Language Research* 22: 487–97. [CrossRef]
- Barcroft, Joe. 2009. Effects of synonym generation on incidental and intentional L2 vocabulary learning during reading. *TESOL Quarterly* 43: 79–103. [CrossRef]
- Barcroft, Joe. 2015. *Lexical Input Processing and Vocabulary Learning*. Amsterdam: John Benjamins.
- Beglar, David, Alan Hunt, and Yuriko Kite. 2012. The effect of pleasure reading on Japanese university EFL learners' reading rates. *Language Learning* 62: 665–703. [CrossRef]
- Bjork, Robert A., and Judith F. Kroll. 2015. Desirable difficulties in vocabulary learning. *The American Journal of Psychology* 128: 241–52. [CrossRef] [PubMed]
- Bjork, Robert A., John Dunlosky, and Nate Kornell. 2013. Self-regulated learning: Beliefs, techniques, and illusions. *Annual Review of Psychology* 64: 417–44. [CrossRef] [PubMed]
- Boers, Frank. 2020. Factors affecting the learning of multiword items. In *The Routledge Handbook of Vocabulary Studies*. Edited by Stuart Webb. New York: Routledge, pp. 143–57.
- Boers, Frank. 2021. *Evaluating Second Language Vocabulary and Grammar Instruction*. London: Routledge.
- Boers, Frank, June Eyckmans, and Hélène Stengers. 2007. Presenting figurative idioms with a touch of etymology more than mere mnemonics? *Language Teaching Research* 11: 43–62. [CrossRef]
- Boers, Frank, Tu Cam Thi Dang, and Brian Strong. 2017. Comparing the effectiveness of phrase-focused exercises: A partial replication of Boers, Demecheleer, Coxhead and Webb 2014. *Language Teaching Research* 21: 362–80. [CrossRef]
- Chung, Mihwa, and I. S. Paul Nation. 2006. The effect of a speed reading course. *English Teaching* 61: 181–204.
- Craik, Fergus I. M., and Robert S. Lockhart. 1972. Levels of processing framework for memory research. *Journal of Verbal Learning and Verbal Behavior* 11: 671–84. [CrossRef]

- D'Agostino, Paul R., Brian J. O'Neill, and Allan Paivio. 1977. Memory for pictures and words as a function of level of processing: Depth or dual coding? *Memory and Cognition* 5: 252–56. [CrossRef] [PubMed]
- Deconinck, Julie, Frank Boers, and June Eyckmans. 2017. 'Does the form of this word fit its meaning?' The effect of learner-generated mapping elaborations on L2 word recall. *Language Teaching Research* 21: 31–53. [CrossRef]
- Dörnyei, Zoltán, and Ema Ushioda. 2021. *Teaching and Researching Motivation*, 3rd ed. London: Routledge.
- Dumay, Nicolas, and M. Gareth Gaskell. 2007. Sleep-associated changes in the mental representation of spoken words. *Psychological Science* 18: 35–39. [CrossRef] [PubMed]
- Elgort, Irina, Natalia Beliaeva, and Frank Boers. 2020. Contextual word learning in the first and second language: Definition placement and inference error effects on declarative and non-declarative knowledge. *Studies in Second Language Acquisition* 42: 7–32. [CrossRef]
- Elgort, Irina, Sarah Candry, Thomas J. Boutorwick, June Eyckmans, and Marc Brysbaert. 2018. Contextual word learning with form-focused and meaning-focused elaboration. *Applied Linguistics* 39: 464–87. [CrossRef]
- Folse, Keith S. 2006. The effect of type of written exercise on L2 vocabulary retention. *TESOL Quarterly* 40: 273–93. [CrossRef]
- Godfroid, Aline, Jieun Ahn, Ina Choi, Laura Ballard, Yaqiong Cui, Suzanne Johnston, Shinye Lee, Abdhi Sarkar, and Hyung-Jo Yoon. 2018. Incidental vocabulary learning in a natural reading context: eye-tracking study. *Bilingualism: Language and Cognition* 21: 563–84. [CrossRef]
- Graham, Suzanne. 2022. Self-efficacy and language learning—What it is and what it isn't. *The Language Learning Journal* 50: 186–207. [CrossRef]
- Hill, Monica, and Batia Laufer. 2003. Type of task, time-on-task and electronic dictionaries in incidental vocabulary acquisition. *IRAL* 41: 87–106. [CrossRef]
- Joe, Angela. 1998. What effects do text-based tasks promoting generation have on incidental vocabulary acquisition? *Applied Linguistics* 19: 357–77. [CrossRef]
- Kida, Shusaku. 2022. Secondary task type, exposure frequency and their combined effects on second language vocabulary learning through reading. *Second Language Research* 38: 213–32. [CrossRef]
- Kida, Shusaku, and Joe Barcroft. 2018. Semantic and structural tasks for the mapping component of L2 vocabulary learning: Testing the TOPRA model from a new angle. *Studies in Second Language Acquisition* 40: 477–502. [CrossRef]
- Kim, Do-Hong, Chuang Wang, Hyun Seon Ahn, and Mimi Bong. 2015. English language learners' self-efficacy profiles and relationship with self-regulated learning strategies. *Learning and Individual Differences* 38: 136–42. Available online: <https://bit.ly/2rrvjYO> (accessed on 28 January 2024). [CrossRef]
- Koval, Natalie G. 2019. Testing the deficient processing account of the spacing effect in second language vocabulary learning: Evidence from eye tracking. *Applied Psycholinguistics* 40: 1103–39. [CrossRef]
- Lamb, Martin. 2017. The motivational dimension of language teaching. *Language Teaching* 50: 301–46. [CrossRef]
- Laufer, Batia, and Bella Rozovski-Roitblat. 2015. Retention of new words: Quantity of encounters, quality of task, and degree of knowledge. *Language Teaching Research* 19: 687–711. [CrossRef]
- Laufer, Batia, and Jan Hulstijn. 2001. Incidental vocabulary acquisition in a second language: a construct of task-induced involvement. *Applied Linguistics* 22: 1–26. [CrossRef]
- Lindstromberg, Seth. 2020. Intentional L2 vocabulary learning. In *The Routledge Handbook of Vocabulary Studies*. Edited by Stuart Webb. New York: Routledge, pp. 240–54.
- Macalister, John, and I. S. Paul Nation. 2020. *Language Curriculum Design*, 2nd ed. New York: Routledge.
- Martin, Christopher. 2020. Response to 'The motivational dimension of language teaching' (Lamb, 2017). *Language Teaching* 53: 233–36. [CrossRef]
- Montero Perez, Maribel, Elke Peters, and Piet Desmet. 2015. Enhancing vocabulary learning through captioned video: An eye-tracking study. *The Modern Language Journal* 99: 308–28. [CrossRef]
- Morris, C. Donald, John D. Bransford, and Jeffery J. Franks. 1977. Levels of processing vs. transfer appropriate processing. *Journal of Verbal Learning and Verbal Behavior* 16: 519–33. [CrossRef]
- Nation, I. S. Paul. 2022. *Learning Vocabulary in Another Language*, 3rd ed. Cambridge: Cambridge University Press.
- Nation, I. S. Paul. 2024. *The Twenty Most Effective Language Teaching Techniques*. London: Routledge.
- Nation, I. S. Paul, and Rob Waring. 2020. *Teaching Extensive Reading in Another Language*. London: Routledge.
- Nation, I. S. Paul, and Stuart Alexander Webb. 2011. *Researching and Analyzing Vocabulary*. Boston: Heinle Cengage Learning.
- Nation, Paul. 2017. How vocabulary is learned. *Indonesian Journal of English Language Teaching* 12: 1–14. [CrossRef]
- Paivio, Allan. 1990. *Mental Representations: A Dual Coding Approach*. Oxford: Oxford University Press.
- Pellicer-Sánchez, Ana. 2016. Incidental L2 vocabulary acquisition from and while reading. *Studies in Second Language Acquisition* 38: 97–130. [CrossRef]
- Pellicer-Sánchez, Ana. 2020. Expanding English vocabulary knowledge through reading: Insights from eye-tracking studies. *RELC Journal* 51: 134–46. [CrossRef]
- Pellicer-Sánchez, Ana, and Norbert Schmitt. 2010. Incidental vocabulary acquisition from an authentic novel: Do Things Fall Apart? *Reading in a Foreign Language* 22: 31–55.
- Peters, Elke. 2019. The effect of imagery and on-screen text on foreign language vocabulary learning from audiovisual input. *TESOL Quarterly* 53: 1008–32. [CrossRef]

- Pigada, Maria, and Norbert Schmitt. 2006. Vocabulary acquisition from extensive reading case study. *Reading in a Foreign Language* 18: 1–28.
- Pressley, Michael. 1977. Children's use of the keyword method to learn simple Spanish vocabulary words. *Journal of Educational Psychology* 69: 465–72. [CrossRef]
- Strong, Brian, and Frank Boers. 2019. The error in trial and error: Exercises on phrasal verbs. *TESOL Quarterly* 53: 289–319. [CrossRef]
- Uchihara, Takumi, Stuart Webb, and Akifumi Yanagisawa. 2019. The effects of repetition on incidental vocabulary learning: A meta-analysis of correlational studies. *Language Learning* 69: 559–99. [CrossRef]
- Underwood, Benton J. 1961. Ten years of massed practice and distributed practice. *Psychological Review* 68: 229–47. [CrossRef]
- Usher, Ellen L., and Frank Pajares. 2008. Sources of self-efficacy in school: Critical review of the literature and future directions. *Review of Educational Research* 78: 751–96. Available online: <http://www.jstor.org/stable/40071145> (accessed on 28 January 2024). [CrossRef]
- Ushioda, Ema. 2020. *Language Learning Motivation*. Oxford: Oxford University Press.
- Wang, Andi, and Ana Pellicer-Sánchez. 2022. Incidental vocabulary learning from bilingual subtitled viewing: An eye-tracking study. *Language Learning* 72: 765–805. [CrossRef]
- Waring, Rob, and Misako Takaki. 2003. At what rate do learners learn and retain new vocabulary from reading a graded reader? *Reading in a Foreign Language* 15: 130–63.
- Webb, Stuart. 2020. Incidental vocabulary learning. In *The Routledge Handbook of Vocabulary Studies*. Edited by Stuart Webb. New York: Routledge, pp. 225–39.
- Wei, Zheng. 2015. Does teaching mnemonics for vocabulary learning make a difference? Putting the keyword method and the word part technique to the test. *Language Teaching Research* 19: 43–69. [CrossRef]
- Wi, Injung, and Frank Boers. 2024. Sequential use of L1 and L2 captions: Exploring the benefits for vocabulary acquisition. *TESOL Quarterly* 58: 511–21. [CrossRef]
- Yanagisawa, Akifumi, Stuart Webb, and Takumi Uchihara. 2020. How do different forms of glossing contribute to L2 vocabulary learning from reading? A meta-regression analysis. *SSLA* 42: 411–38.

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