Understanding the Functions of Pattern Language with Vygotsky's Psychology
Signs, The Zone of Proximal Development, and Predicate in Inner Speech

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This paper examines learning and dialogue with pattern languages, using psychological theories outlined by Lev Semenovich Vygotsky. Vygotsky, known as the Mozart of Psychology, is a Soviet psychologist who examined developmental psychology from both experimental and theoretical perspectives. This paper focuses on the function of pattern languages using Vygotskian theories such as Vygotsky's triangle (subject – sign - object), zone of proximal development, inner speech, and predication. Through this examination, the following ideas are proposed. Patterns in a pattern language support human action much like the "signs" in Vygotsky's triangle. The act of choosing and executing a desired pattern can be understood as development of learning that result from setting one's own zone of proximal development. Furthermore, patterns are written with predication (when written in Japanese), making the patterns feel as though it is the inner speech of the reader, which encourages readers to incorporate the patterns into their learning. The paper focuses on examining theories of Vygotsky, but aims to provide understanding on the function and meaning of pattern languages.

1. INTRODUCTION

During the first half of the twentieth century in Soviet, there was psychologist named Lev Vygotsky, who through his immense contribution was later called "the Mozart of Psychology." Through his research in developmental psychology, he made many significant contributions including his theory on cultural and biosocial development, known as cultural-historical psychology. His theory that human reasoning is mediated by signs and symbols is another contribution that remains influential.

In this paper, the function of pattern languages is examined through such Vygotskian perspective. The reader may wonder whether there is validity in examining a theory that was created more than eighty years ago, in a societal context that is very different from the present world. However, this question can be countered by the simple fact that Vygotsky's theoretical framework remains influential in the study of learning and development, and that his works continue to be referenced by researchers in this field.

2. THE FUNCTION OF PATTERN LANGUAGES AS VYGOTSKIAN SIGNS

Vygotsky went beyond the stimulus-response paradigm and proposed that psychic tools mediate function. Because psychic tools form as a result of loose societal connections, the workings of the mind are not closed to individuals but are rather mediated socially. This indicates that education can affect individuals' learning and psychological development. Vygotsky's view of the mediatory relationship between the workings of the mind and societal intermediaries is an idea that remains true in modern psychology.

The description above is represented by what is called "Vygotsky's Triangle" (Figure 1). This figure shows us that we as "subjects" relate to "objects" through "signs", which mediate our actions (Vygotsky, 1987). We do not directly influence the world with our own hands, but do so through artificial tools, or "signs"[1] These signs are not creates by individuals but are rather formed by the society as a whole.

Using this framework, we can say that pattern languages function as "signs" (psychic tool) that mediate the relationship between the subject and the object (Figure 2). First of all, pattern language function as signs, which help recognize the world by using them. This is consistent with our understanding of pattern languages as glasses of recognition (Figure 3). Moreover, pattern language

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[1] There is another outstanding philosopher who studied relation between language and thought: Charles Sanders Peirce, the father of Pragmatism and semiotics. Only few papers consider the relation between Vygotsky and Peirce (Edwards, 2007; Miller, 2011). Although, in our view, Peirce's philosophy is quite important to position pattern language in philosophy, this paper focuses only on Vygotsky's theory because of avoiding complicated.

also function to enhance a person's motivation to try the action that is suggested as the solution in each pattern. Therefore, patterns have the ability to encourage a person's future action.

Sign

Subject   Object
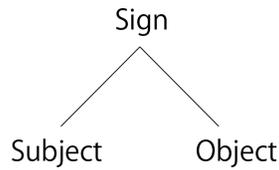
Figure 1: Vygotsky's Triangle

Pattern

Subject   Object
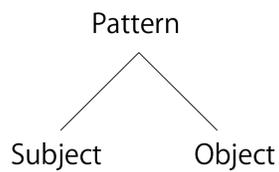
Figure 2: Pattern Languages functioning as "signs" (a psychic tool)
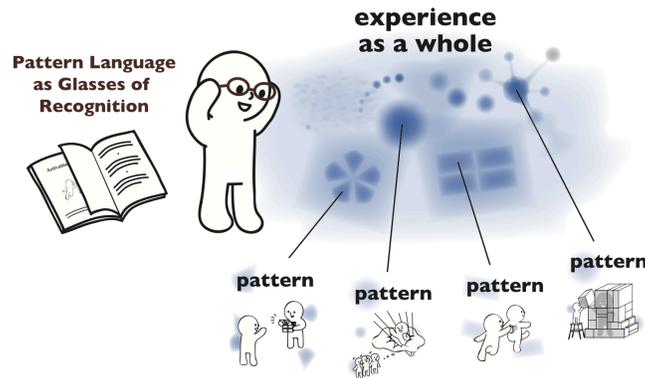
Figure 3: Pattern Language as Glasses of Recognition

In *The History of the Development of Mental Functions* (Vygotsky, 1997), Vygotsky uses the "Buridan's ass" paradox to describe the function of "signs." This paradox is named after the fourteenth century French Philosopher and scientist, Jean Buridan. Although Buridan was not the one to come up with the paradox, it continues to be called by this name.

The anecdote is as follows. A hungry ass is placed equally between two very similar stacks of hay. In this situation, the ass is bound to die of hunger because the inducement placed on the ass is equally strong and pulling in opposite directions. In other words, the ass dies of hunger due to its inability to make a rational decision. Through this example, he shows his criticism toward a mere stimulus-response way of thinking, and also rejects a priori-based philosophical thinking.

What Vygotsky instead proposed is the idea that humans deal with these sorts of paradoxes by bringing in "signs" that are unrelated to the given situation. Flipping a coin to make a decision is an example. The flip of the coin in this case function as a "sign" that helps the decision-making process.

According to Vygotsky's way of thinking, the flip of the coin introduces a completely new framework than the Buridan example. By flipping the coin, the person is setting an action-stimulating factor, and is using it to control his or her own course of action. Therefore, people are able to get aid from artificial stimuli when making their own decisions.

Vygotsky also refers to William James' analysis on voluntary act using the example of a person waking up in the morning. The example says that when a person awakes from sleep, they experience conflicting emotions of knowing that they must wake up and also wanting to sleep longer. Therefore, there is a conflict of motives that appear in the mind simultaneously. When under such a situation, a person may decide to count "one, two, three" and wake up at the count of three. In this instance the person is setting a stimulus (the counting), and acts in response to it, thereby successfully controlling his or her own actions.

According to Vygotsky, the creation and usage of stimuli to encourage one's own action is a way to distinguish higher-level actions from basic actions. He observed that the usage of both artificial stimuli and stimuli given in a particular situation is the distinct characteristic of human psychology.

Such artificial stimuli are what Vygotsky called "signs." The signs are automatic stimuli that humans bring into their minds and use as auxiliary motives. According to his definition, signs are the various stimuli that a person induces with the intent to control the course of action for himself or others.

Signs function similarly to "tools", but these two things are not the same. Vygotsky makes the distinction in the following statements: "the tool's function is to serve as the conductor of human influence on the object of activity… it must lead to changes in the object. The sign, on the other hand, changes nothing in the object of a psychological operation. It is a means of internal activity aimed at mastering oneself" (Vygotsky, 1978, p.55). Simply put, the tool is externally oriented whereas the sign is internally oriented.

According to Vygotsky, the most exemplary form of "sign" that exist is words. Words mediate humans' higher mental functions and enables people to control their mentality and act upon it. Pattern languages also function as mediators of words and are "signs" that encourage people to take action based on mental inputs.

3. THE ZONE OF PROXIMAL DEVELOPMENT

Perhaps the most well known Vygotskian theory is the "zone of proximal development" (ZPD) (Vygotsky, 2012). Vygotsky's definition of the zone of proximal development is as follows: "*the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance, or in collaboration with more capable peers.*" (Vygotsky, 1978, p.86). This theory is closely related to his argument that a child's state of development should not only be measured in terms of the knowledge he or she currently has, but also in terms of his or her potential level of development. In this context, we propose that pattern languages can support people's growth in their zones of proximal development. We will take a look at the zone of proximal development theory and examine its relation to pattern languages.

As a developmental psychologist, Vygotsky argued that more attention should be given to what learners can *almost* do; that is, what learners can't do on their own, but can with guidance or help from their peers (Figure 4). He uses an example of apples in an orchard to explain that the state of development is not only determined by the parts that are already developed, but also by the parts that are in the process of developing. If you owned an apple orchard and wanted to see how your orchard is doing, you would not just count apples that are fully ripe, but would also take into account the apples that are on its way. In the same way, one must consider not only the fully developed functions but also the functions that are in the developing process, or the zone of proximal development of the learner.

Zone of proximal development is important because it allows us to properly redefine the concept of development. Vygotsky stated that in ancient psychology and common knowledge, there is a strong tendency to see "imitation" as something that can be done simply and functionally; something that anyone can do.
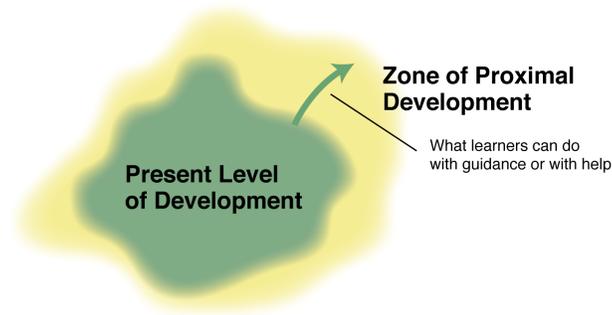
Figure 4: Zone of Proximal Development

However, children can only imitate actions that are within the range of their present abilities. Therefore, in order to imitate an action, there must be some sort of transition from what the learner cannot do to what they can do. Thus, children can always do more if they have guidance. However, this does not mean that they will be able to do everything; it must be within the range of potential ability for the child. Therefore, Vygotsky concluded that the possibility of learning is dependent on the child's zone of proximal development, and insisted that teaching is only effective when the teacher is able to anticipate the child's potential development (Vygotsky, 2012).

Vygotsky's theory of the zone of proximal development has been applied to pedagogy in schools. The ideas of the theory have been used in designing education with a focus on the students' zone of proximal development, and guiding their development. The theory has also been influential in the discussion of what the roles of teachers are in an educational setting.

With this background, this paper will examine the function of pattern language as a way to support growth in one's zone of proximal development. Pattern language aims to enable the learners to choose and practice the patterns on their own, without having to get help from others (teachers). Consequently, pattern languages have the potential to expand one's zone of proximal development internally.

According to Vygotsky, the zone of proximal development differs from person to person (Vygotsky, 2012). Children that are the same age will be at different development stages due to that fact that their zones of proximal development are unique and differ from their peers. Therefore, it's reasonable that when you share a pattern language with a group of people, each person has a difference combination of patterns that they have or have not experienced, or would like to experience in the future. Furthermore, it is crucial for a person to choose their own desired patterns based on their present situations in order to maintaining a continuous cycle of learning [2].

Here we show some cases to better understand and visualize the concept of the zone of development, through examples of applying the Learning Patterns. The Learning Patterns consist of 40 patterns to enhance creative learning by providing an opportunity for learners to reflect on their learning styles, to discover or rediscover good habits, and to obtain new insights into how they can become a better learner (Iba, et al., 2009; Iba & Miyake, 2010; Iba & Sakamoto, 2011; Iba & Iba Lab, 2014a). We have organized dialogue workshops where participants used the Learning Patterns to reflect on their experiences, talk about them with others, and make plans for future actions using the patterns (Iba, 2015).

In this workshop, participants are first asked to look at the Learning Patterns and recall their experiences with the patterns. Secondly, they are asked to choose five new patterns that they wish to master in the near future. Then, participants are free to mingle and talk with other participants. When they find another participant who has already experienced a pattern they want to master, they listen to the other participant's story (Figure 5).

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[2] Another type of dialogue to apply patterns into daily life is "Pattern Concierge." See Mori et al. (2016).

Figure 5: Dialogue Workshop with the Learning Patterns (Keio University, 2016)

Figure 6 is a chart presenting the experiences of freshmen in our university with the Learning Patterns (Iba 2014). The green area shows the patterns he/she has experienced, and the yellow area shows which patterns he/she wants to gain. The yellow area therefore represents potential zone of development, which was chosen by the learner. Figure 7 shows examples of other students. These show the diverse shapes of experiences and various ranges of each student's potential zone of development. It can be considered that by using the pattern language, students are setting their own zone of proximal development.
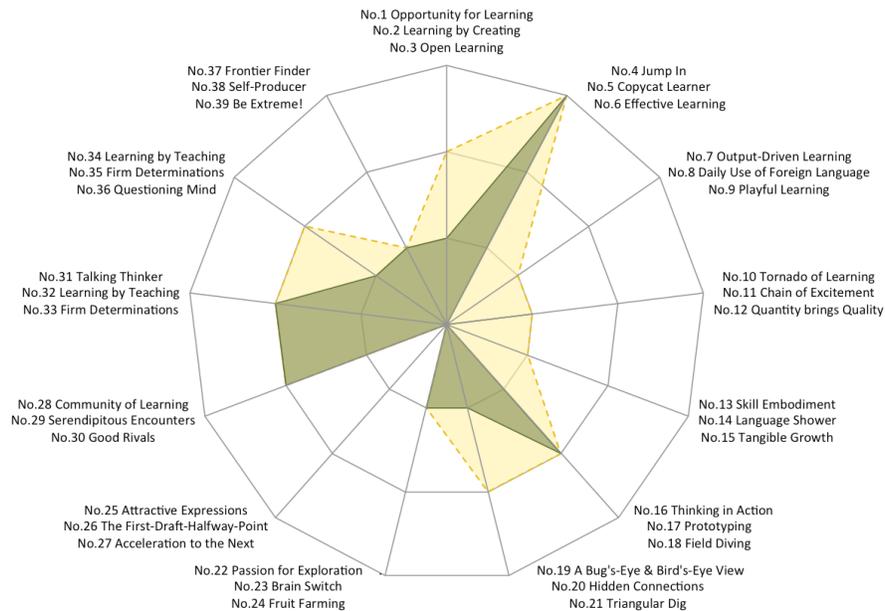

Figure 6: An Example of a Pattern-Experience Chart
(College Freshman, Learning Patterns)
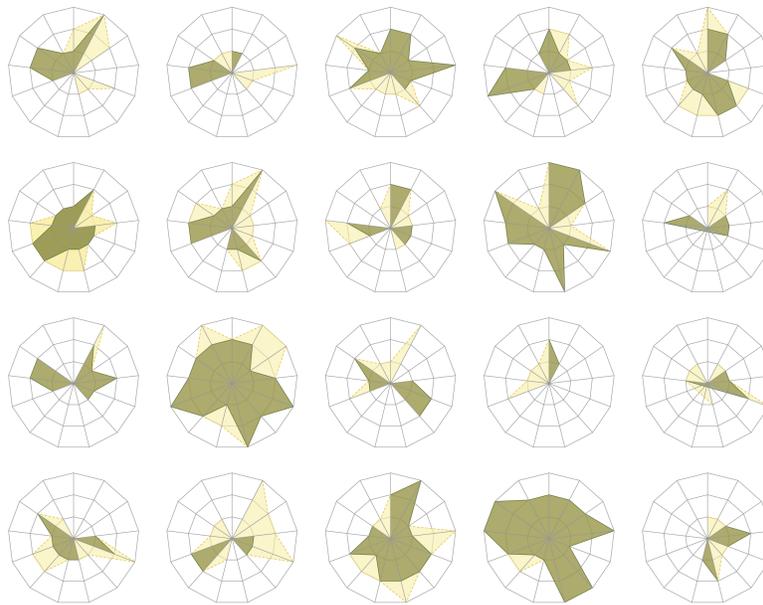
Figure 7: Other Examples of Pattern-Experience Charts
(College Freshmen, Learning Patterns)

After the students practice the Learning Patterns, how will these charts change? Figure 8 shows the evolved chart of the same student shown in Figure 6. The dark green area shows the range of experience when the student was a freshman, and lighter area shows the expanded zone of experience after 1.5 years.
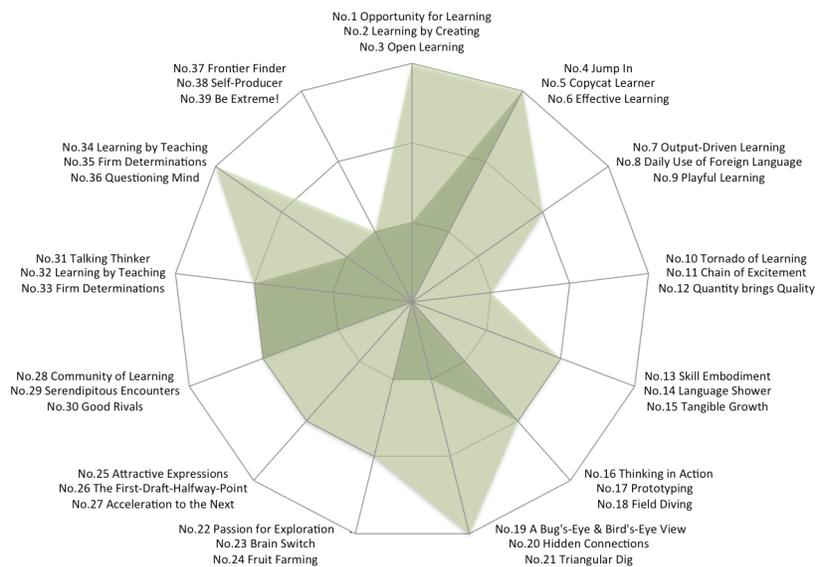
Figure 8: An Example of a Pattern-Experience Chart
(College Freshman and 1.5 years later, Learning Patterns)

Students after
1 year in College

Students after
1.5 years in College

Students after
2 years in College

Students after
3 years in College

Students after
4 years in College

Students after
5 years in College
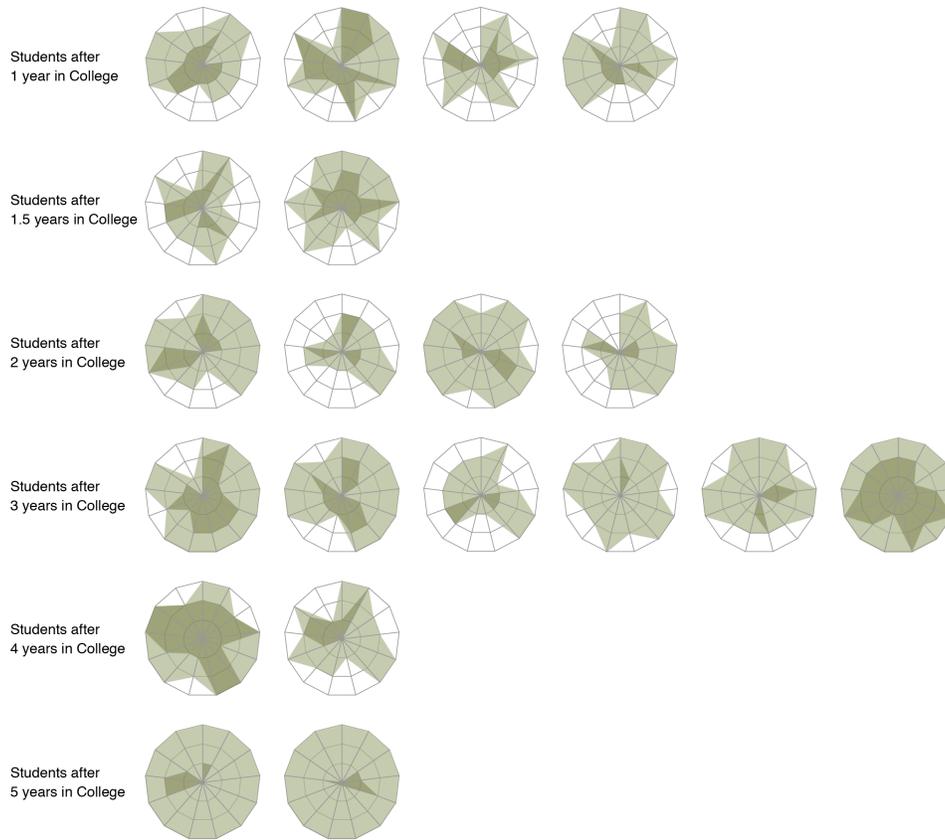
Figure 9: Growth of Pattern-Experience Charts (Learning Patterns)

Figure 9 shows pattern-experience charts of students in the Iba lab, arranged by the number of years that have passed after the first experience check when they were freshmen. Although each is unique, you can see the trend that the green zone (experienced) expands year by year. Figure 10 shows the expansion of two different student's experiences from when they were freshman, three years later, and then five years later.
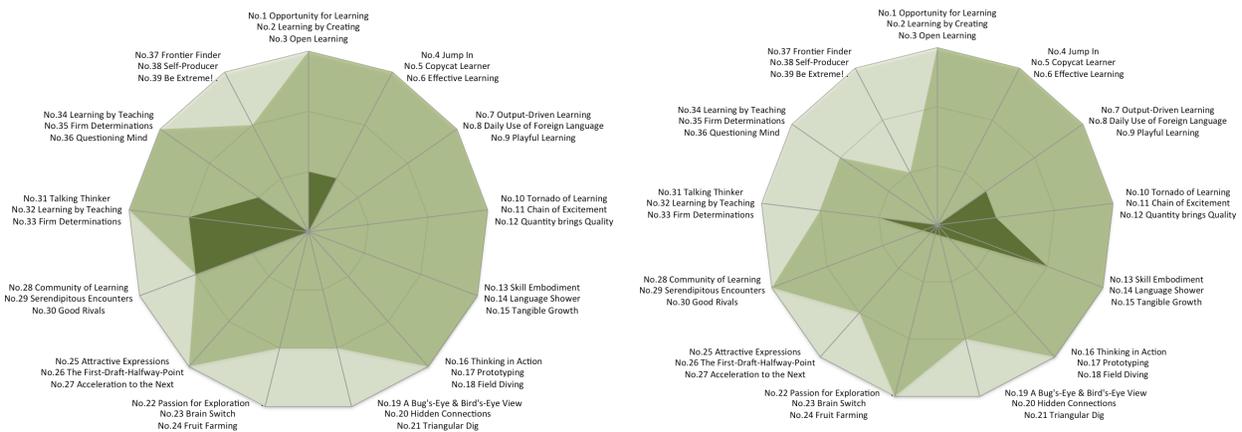
Figure 10: Growth of Pattern-Experience Chart
(Freshman, 3 years later, and 5 years later; Learning Patterns)

The examples so far show growth of learning experiences, but we can grasp the shape of experiences using other pattern languages as well. Figure 11 shows a student's growth of experience with the Collaboration Patterns (Iba and Isaku, 2013; Iba & Iba Lab, 2014b). At the beginning of each semester, each student in the Iba Lab writes a plan for their learning and collaboration in projects, using the Learning Patterns and the Collaboration Patterns. The yellow area represents the zone of patterns that he/she said would like to experience in the coming semester, and the orange area represents the experienced he/she has already experienced. It can be considered that through this process, the students are designing their own learning in their zone of proximal development; something that is possible because they can refer to the patterns. Other examples are shown in Figure 12 [3].
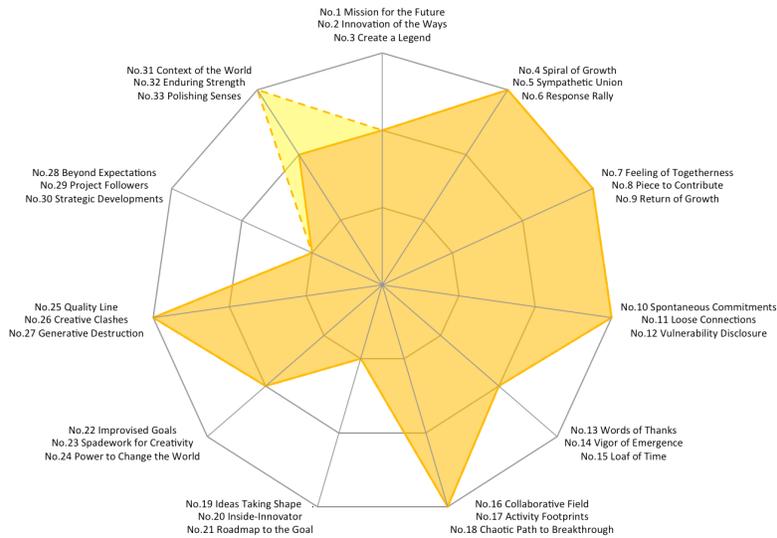
Figure 11: Example of a Pattern-Experience Chart (Patterns Already Experienced and Patterns Planning to Experience in upcoming Semester; Collaboration Patterns)
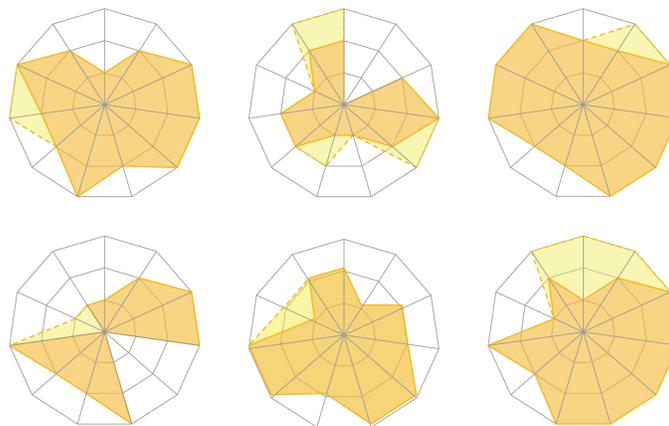
Figure 12: Other Examples of Pattern-Experience Chart (Patterns Already Experienced and Patterns Planning to Experience in upcoming Semester; Collaboration Patterns)

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[3] It is possible to make a comprehensive chart that shows learning and evolution within a group of people (or even society). We currently do not have enough data to get a good insight on the evolution, but we believe this is possible, and could be something to work on in the future.

4. INNER SPEECH AND THE PREDICATE

In *Thought and Language* (Vygotsky, 2012), Vygotsky examines the relationship between thought and language, and discusses the characteristic of "inner speech." Inner speech is speech that is formulated within the mind but not expressed out loud as spoken language. Inner speech may include thoughts like, "(I) should go eat lunch after work is over" or "What should (I) do tomorrow?"

Vygotsky states that one characteristic of inner speech is that it is completely in the form of predicate. In other words, human thoughts exclude the use of pronouns, and are instead centered on the predicate. Therefore, inner speech is not going to be something like "After I finish my work, I am going to get myself some lunch." The sentence's subject is naturally omitted in a person's mind, because there is no need to specify the subject when talking to oneself through inner speech.

This characteristic is important when considering pattern languages, because when a person reads a pattern and thinks about the action they will take in the near future, the pattern will be replayed in the mind as inner speech. Thus, when thinking about how to put a pattern into action, the reader will form an inner speech in which the pronoun is omitted.

On the other hand, sentences that are written out will have syntax. This is because the written language does not have am interlocutor, and thus the sentences must provide detail about who or what the subject is. In written language, the interlocutors are in various situations, so there is not a common subject that can be used. This is why the written language must be written more specifically and structurally complicated than spoken language.

Interestingly, sentences in the Japanese language can exist without the specification of pronouns at all times, even when written. This is because Japanese is a pro-drop language that allows sentences to lack an explicit pronoun, without even changing the verb form[4]. Therefore, when writing pattern in Japanese, we are able to completely omit the pronoun, just as we do when we form inner speech in our minds. The original Japanese version of the patterns we have been writing are all written without the specification of the pronoun.

Figure 13 shows the Japanese version of "Self-Intro Album" (No.13) of Words for a Journey patterns (Iba et al, 2015a, 2015b, 2015c, 2016). There are 15 sentences in Japanese: 1 sentence in Introduction, 1 in Context, 4 in Problem, 5 in Solution, 4 in Consequence. All of these sentences were intentionally written without indicating the pronoun, or the subject of the sentences to the reader. That is, the word, "you" is never mentioned in the pattern. On the contrary, in the English version (Figure 14), there are 13 sentences in the pattern, but the word "you" appears as the subject 6 times, and 3 of the sentences are imperative. Although the pro-drop characteristic is inevitably lost when the patterns are translated into English, the Japanese version of the patterns is completely pronoun-less in all sections (context, problem, solution, consequence) (Figure 15).

By avoiding using the pronoun of the subject, "you," pattern descriptions can be written in inner-speech style. When the word, "you" is used in a pattern description, it implies that there is someone within the sentences who is giving advice to the reader. On the contrary, in the Japanese description without the "you," the reader doesn't have to suppose that there is somebody who is giving advice. We do this with to intent to make the patterns read as if it is the inner speech of the readers themselves, instead of advices from the pattern writer. So when writing the patterns in Japanese, the solution is written without a pronoun, making it easier for readers to feel as if the words came from their own inner speech.

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[4] Note that the Japanese language drops pronouns even though the verbs do not change forms based on pronouns. Korean language is the same to Japanese. Spanish and Italian are other pro-drop languages, but omitted pronoun can be imagined by knowing he changes in verb form. Russian are similar to this type of language.

No.9

なじみの居場所

家族も知っている外出先をつくる。

認知症だからといって、ずっと家のなかにいると気が滅入ってしまいます。同じ場所に居続けるのはストレスがたまりやすいものだからです。しかし、あちこち自由に出かけようとすると、家族が心配するかもしれません。もしかしたら出先で状況がわからなくなり、困ってしまう可能性があるからです。

▼そこで

自分ひとりで行けて、家族も知っている行きつけの場所をつくります。すでにそのようなお気に入りの場所があれば、そこを自分の《なじみの居場所》だと家族に伝えておきます。まだない場合には、家の近くの喫茶店や小さな美術館など、居心地のよさそうな場所を探すことからはじめます。家族や友人と一緒に探すと安心です。よさそうな場所が見つかったら、その場にいる店員さんや常連さんたちに、ひとこと挨拶をしておくと早くなじむことができるでしょう。

▼そうすると

家のほかに居心地のよい場所があることで、豊かな時間を過ごすことができます。ほかの人とともにする時間も増えるでしょう。家族にとっても、いつもの《なじみの居場所》にいるとわかっていれば安心です。万が一、認知症の症状が出て困ったとしても、なじみの店員さんや常連さんがいれば、状況を理解して対応してくれるでしょう。

外に出るよりも家にいることが多くなりました。

▼そのとき

▷ 12. 今を楽しむ ▷ 34. その場の助っ人 ▷ 36. 個人的なつきあい

20 21

Figure 13: Pattern "Self-Intro Album" written in Japanese（Iba et al., 2015a）

No.9

Favorite Place

A place outside the home,
which your family also knows about.

Staying inside your home all the time is not fun and may be tiring. No one likes to stay in the same place all the time. However, if you freely go out, your family may become worried that you may become confused and lost while you are out alone.

▼ Therefore

Find a place where you can go by yourself without any trouble, and make sure your family knows about the place too. If you already have such a place, tell your family that it is your "Favorite Place." If not, find a place such as a coffee shop or art museum near your home that you like, where you feel comfortable. You can ask a friend or a family member to help you find this place. Once you find your place, it would be nice to say hello to the people there so you can get on well early.

▼ Consequently

By having a second place besides your home where you can feel comfortable, you will be able to spend good times outside your home. Your family will feel comfortable letting you go out alone too if they know you are at your "Favorite Place." Even if a symptom of dementia occurs at the place, if the people there know about you, they would be able to treat you properly.

You have begun spending less time outside and more time inside your home.

▼ In this context

▷ 12. Live in the Moment   ▷ 34. On-the-Spot Helper   ▷ 36. Personal Connections

20 21

Figure 14: Pattern "Self-Intro Album" written in English（Iba et al., 2015b）

Figure 15: Comparison between Japanese sentence and English sentence
in the "Self-Intro Album" pattern

In addition, it can also be noted that the Solution statement of the patterns in Japanese is not written as imperative sentences, but as normal sentences without a pronoun (Figure 15). The Japanese language does not differentiate its present tense and future tense verbs. Therefore, the reader can choose the tense of the sentence as they see fit in their situation. For instance, if they have been already doing the Solution, they can read the sentence in the present tense; if they have never done the pattern, they will read the solution in the future tense. Thus the readers can understand the solution sentence of the pattern as either a statement of what that person is currently doing (present tense), or something the person will do in the future (future tense).

In addition, Vygotsky also discusses the case of pure predication in external speech (Vygotsky, 2012). When communicating by external speech, there is no need to specify the subject pronoun if the listener is aware of the conversation's context. The dialogue workshops we have held in the past years where participants discuss about their life experiences using the patterns, is an example of this (Figure 16). During the one-on-one conversations that take place, the person who is speaking will omit the subject pronoun once the context has been shared and mutually understood with the listener. Once the subject can be omitted, the conversation will be reduced to predicates, since there is no longer a need to specify the subject pronoun of the conversation. Therefore, the speaker will only talk about the experiences themselves, and the listener will assume that the subject is the speaker.
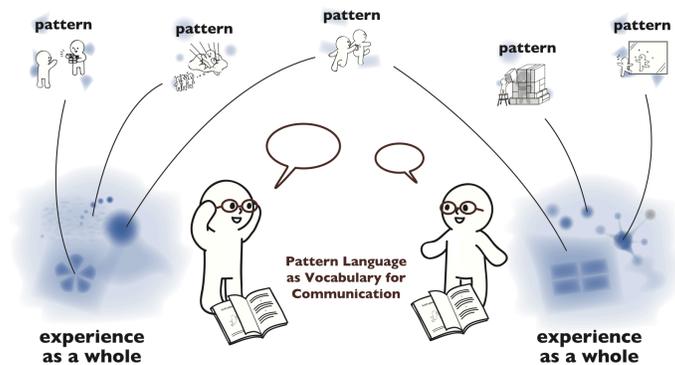

Figure 16: Predication Appears in Dialogue about Experiences with Pattern Language

5. CONCLUSION

In this paper, we explore the function of pattern language with Vygotsky's psychology, especially, signs as psychic tools, Zone of Proximal Development, and inner-speech and predication. In this consideration, the differences among languages are studied. We anticipate that this paper evoke future discussion on the function of pattern language with psychology.

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