
Using pattern languages as media for mining, analysing, and visualising experiences

Takashi Iba

Faculty of Policy Management,
Keio University,
Endo 5322, Fujisawa,
Kanagawa, Zip 252-0882, Japan
E-mail: iba@sfc.keio.ac.jp

Abstract: This paper proposes applying pattern languages to mining, analyses, and visualisation of experiences. The method of pattern language has been developed for scribing and sharing practical knowledge in a certain domain and have been applied to fields including architecture, software, and education. In this paper, pattern languages are considered as media for mining, analysing, and visualising experiences, and as an example the case of *the learning patterns*, a pattern language for creative learning, is taken as follows: 1) holding dialogue workshops in order to support people to mine experiences with patterns; 2) plotting how many people have already experienced each pattern and how many people want to acquire each pattern in the near future; 3) visualising the co-experience network of patterns and the charts expressing the change of experiences in light of the patterns. Furthermore, two other cases, the *presentation patterns* and the *collaboration patterns*, are introduced as additional examples. From these cases, this paper concludes that pattern languages can be used as media for mining, analysing, and visualising experiences enabling people to share tacit, practical knowledge.

Keywords: pattern language; learning; presentation; collaboration; network.

Reference to this paper should be made as follows: Iba, T. (2014) 'Using pattern languages as media for mining, analysing, and visualising experiences', *Int. J. Organisational Design and Engineering*, Vol. 3, Nos. 3/4, pp.278–301.

Biographical notes: Takashi Iba is an Associate Professor at the Faculty of Policy Management and the Graduate School of Media and Governance of Keio University, Japan. He has made many pattern languages concerning human actions, including learning, presentations, collaboration, and education, with his collaborators. He received his PhD in Media and Governance from Keio University in 2003, and continued on as a Visiting Scholar at the MIT Center for Collective Intelligence, 2009–2010. He authored scientific textbooks such as the bestselling *Introduction to Complex Systems* (1998, in Japanese), *Pattern Languages* (2013, in Japanese) and *Social Systems Theory* (2011, in Japanese).

This paper is a revised and expanded version of a paper entitled 'Pattern languages as media for the creative society' presented at the 4th International Conference on Collaborative Innovation Networks (COINs2013), Santiago, Chile, August 2013.

1 Introduction

In daily life, people have various types of experiences and learn from them. Some of what they learn is worth sharing with others, since they may face the similar situations in the future. Over the last two decades, *pattern language*¹ has been studied as a way to share such practical knowledge among people. Pattern languages are used to scribe out the practical knowledge in a target domains, where practical knowledge refers to both the intelligence to notice problems as well as to solve them. Pattern languages, in other words, describe what kinds of problems occur under certain contexts, along with solutions or actions that can be taken to solve the problems.

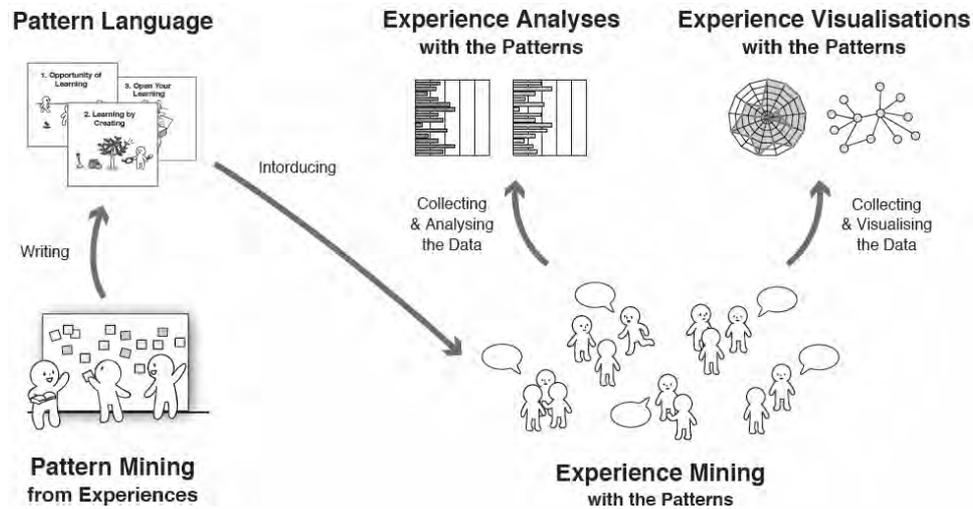
The original idea of using pattern languages to write out design knowledge was proposed by architect Alexander (1979). The late 1970s book he wrote with his colleagues contained 253 patterns on practical architectural design (Alexander et al., 1977). In the context of architecture, the pattern language was developed in order to serve a lingua franca for designing buildings between architects and residents (Alexander et al., 1985). Alexander anticipated that people could get involved in the designing process of their homes and towns.

Ten years after the book was published, Alexander's idea of pattern languages was adopted in the field of software design (Beck and Cunningham, 1987; Gamma et al., 1994). By also scribing out technical knowledge about software design, its primary purpose came to be filling in the technical gap between the experts and the less experienced. Software designers who wished to improve their skills read the patterns to learn from the design knowledge of the more experienced programmers (Gamma et al., 1994).

Since the 1990s, the fields in which pattern languages are applied have shown even more expansion to cover creative human actions such as education (Anthony, 1996; Bergin, 2000; Bergin et al., 2011; Köppe, 2011; Pedagogical Patterns Editorial Board, 2012; Iba et al., 2011; Shibuya et al., 2013), organisational change (Manns and Rising, 2005), learning (Hoover and Oshineye, 2009; Iba et al., 2009; Iba and Miyake, 2010; Iba and Sakamoto, 2011), presentation (Iba et al., 2012a), collaboration (Iba and Isaku, 2013), social innovation (Shimomukai et al., 2012), disaster prevention (Furukawazono et al., 2013a, 2013b), life design (Nakada et al., 2013; Matsuzuka et al., 2013), and even beauty in daily life (Arao et al., 2012), where I name this new type of pattern languages 'Pattern Language 3.0' (Iba, 2011a, 2012). Pattern languages are now used to connect all kinds of people with all kinds of different experiences. The patterns help bring light to the less noticeable parts of a person's experience, so the person can reconsider the experience to talk about it and share it with others.

Despite its potential, little has been discussed about how to utilise pattern languages so far. In this paper, I propose the new usage of pattern language as a method to mine, analyse, and visualise experiences and people's embedded learning from these experiences (Figure 1). In what follows, Section 2 overviews the process of mining patterns from experiences and presents the new usage of pattern languages: experience mining with patterns, experience analyses with patterns, and experience visualisation with patterns. Then, Section 3 introduces the *learning patterns* as a case and shows some results of applications of mining, analyses, and visualisation with using the learning patterns. After that, Section 4 adds two more cases: the *presentation patterns* and the *collaboration patterns*. And finally, Section 5 concludes with the possibility of pattern language as media for mining, analysing, and visualising experiences.

Figure 1 The overview of experience mining, experience analyses, and experience visualisation with patterns



2 Mining process and new usages of pattern languages

Before proposing the new usages of pattern languages, I will begin by introducing the making process of a pattern language. The process is formed from the following two phases: pattern mining and pattern writing.

The starting point is to discover embodied patterns in the minds and activities within the target community. This phase is called the *pattern mining*, associated with the metaphor of geological mining (Gabriel, 1996; DeLano, 1998). This metaphor emphasises the point that the patterns in a pattern language are not invented but are rather discovered. 'Great pattern writers', Gabriel (1996) says, "are miners, they create nothing except the wonderful explanation". As this quote states, making a pattern language has two aspects – namely discovery and explanation. The former aspect is related to this first phase – *pattern mining*; the latter refers to subsequent phases – namely, the *pattern writing*.

The first step the miners take is to explore their own experiences, obtain episodes, and observe the target community and people concerned. Through the exploration, they need identify the acts of people who can perform well, which ought to integrate to form a whole, and then understand the underlying skill of the acts. Here, the extracted practical solutions are potential ideas for patterns. Through the exploration, they must identify people's hidden knowledge used for the target. This knowledge may include rules, methods, tips, or customs associated with the domain.

After collecting the ideas, the next step is to organise them by compiling similar ideas, dividing them into groups, giving names to the groups, and making connections between the groups according to their meanings. Note that these groups must be organised through emergence by iterating the operation to bring one idea near another and to keep one away from others – not by referring to existing superficial categories. This process is well-known as the KJ method in Japan (Kawakita, 1967) and it requires abductive reasoning proposed and emphasised by Peirce (1992, 1998). The process

continues onto giving names to the emerged groups, and then moving the groups around in a similar matter as the KJ Mmethod, so groups with similar meanings become close. Thus, the miners obtain the seeds of the patterns.

After this, the miners will write the skills described in the emerged groups each as a solution of a pattern. Then, they will track back to think about and describe the corresponding problem to the solution. We first describe the solution, and then describe the corresponding problem. Thus, the ‘miners’ obtain core parts of patterns and their relations.

As Alexander (1979) says from the beginning, all patterns are mere hypotheses, and the language should evolve over time. To check the validity and quality, writers’ workshops are often held in conferences (Gabriel, 2002). Since the aim of this paper is to propose new usage of pattern languages, I will not focus on the validity of the respective patterns. In addition, the point I wish to emphasise is that neither universality nor comprehensiveness of patterns is claimed in this paper. Although, like all natural languages, pattern languages provide vocabulary to shed light not only on a part of the world, it can also be useful to understand, describe, and share domain experience in the world.

2.1 Experience mining with patterns

One way to support people to mine experiences with patterns is by giving them a checklist of patterns to reflect on their own experiences. If they can recall an episode from the past about the pattern, they will place a checkmark beside it. There is an online system which supports this process by diagnosing users through a series of questions based on a pattern language (Isaku et al., 2013).

Another way to mine experiences with patterns is to hold a workshop for experience mining. As preparation for the workshop, participants would make a list of patterns that he/she has already experienced. Then, each participant seeks others who experienced patterns he/she wants to master, and listens to their episodes (Iba, 2011b, 2011c; Iba et al., 2012b).

2.2 Experience analyses with patterns

Every time the workshop is held, data on the number of people who have experienced each pattern, and the number of people who want to acquire each pattern in the near future can be recorded. As I wrote above, the workshop first asks participants to read all the patterns beforehand, and list the patterns that they have already experienced and the patterns they wish to use in the near future. The data will visually show the experience embedded in people’s tacit knowledge. Also, using the data, we can examine whether each pattern has generality and has been experienced by others, not only by the pattern miners. This can become a means to evaluate the pattern language.

2.3 Experience visualisation with patterns

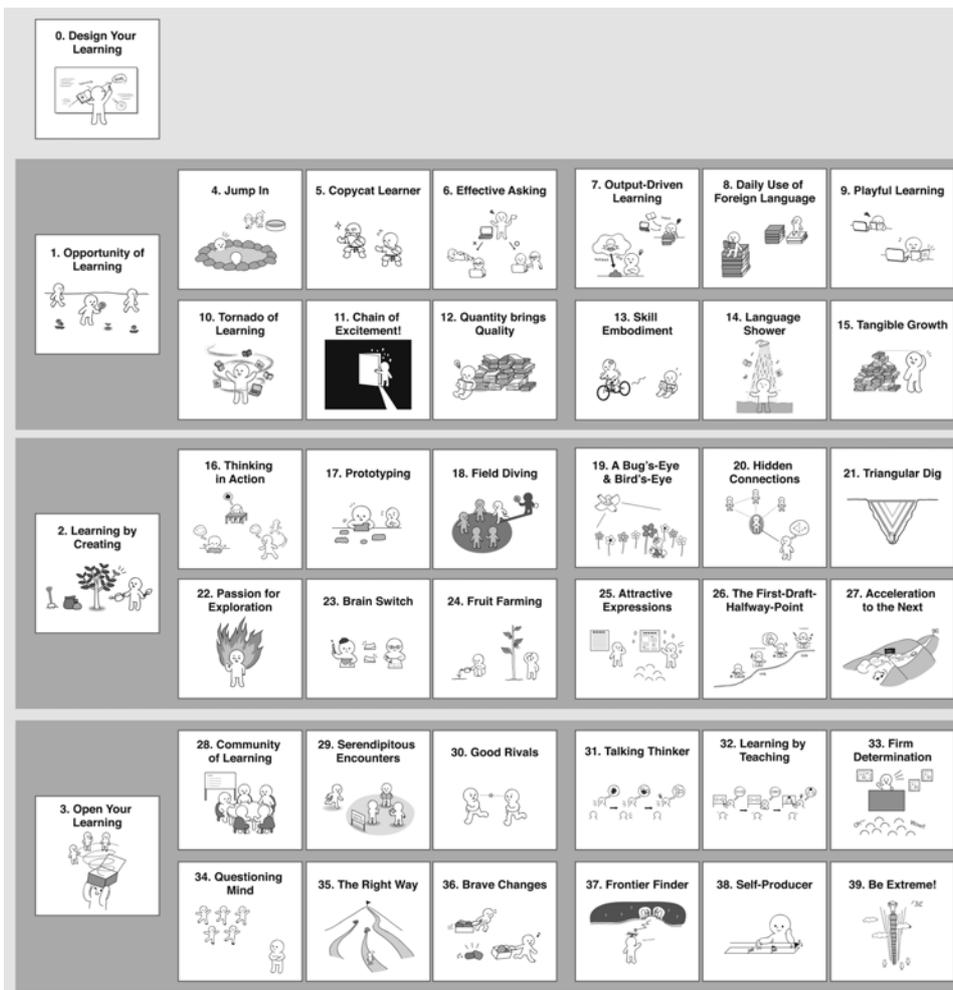
The data will visually show some hidden relations among patterns or among people. For example, it will show the co-occurrence network of patterns, where a node indicates a

pattern and the link shows co-occurrence, meaning that the link is made between nodes if both patterns are experienced by the same person. It will also show the co-experience network of patterns and the co-experience network of participants can be visualised. In addition, a chart expressing the change of experiences in light of the patterns can also be visualised. This kind of visualisation is possible only if the experiences are mined through the patterns.

3 Case: the learning patterns

The case we want to explore here is the *learning patterns*, which is a pattern language for creative learning (Iba et al., 2009; Iba and Miyake, 2010; Iba and Sakamoto, 2011). This pattern language provides an opportunity for learners to reflect on their learning style to rediscover good habits they have, and to get new insights on how they can improve to become a better learner.

Figure 2 The overview of the *learning patterns*



The *learning patterns* consists of 40 patterns as follows (Figure 2):

- 0 Design Your Learning
- 1 Opportunity of Learning
- 2 Learning by Creating
- 3 Open Your Learning
- 4 Jump In
- 5 Copycat Learner
- 6 Effective Asking
- 7 Output-Driven Learning
- 8 Daily Use of Foreign Language
- 9 Playful Learning
- 10 Tornado of Learning
- 11 Chain of Excitement!
- 12 Quantity brings Quality
- 13 Skill Embodiment
- 14 Language Shower
- 15 Tangible Growth
- 16 Thinking in Action
- 17 Prototyping
- 18 Field Diving
- 19 A Bug's-Eye & Bird's-Eye
- 20 Hidden Connections
- 21 Triangular Dig
- 22 Passion for Exploration
- 23 Brain Switch
- 24 Fruit Farming
- 25 Attractive Expression
- 26 The First-Draft-Halfway-Point
- 27 Acceleration to the Next

- 28 Community of Learning
- 29 Serendipitous Encounters
- 30 Good Rivals
- 31 Talking Thinker
- 32 Learning by Teaching
- 33 Firm Determination
- 34 Obvious Reason
- 35 The Right Way
- 36 Brave Changes
- 37 Frontier Finder
- 38 Self-Producer
- 39 Be Extreme!.

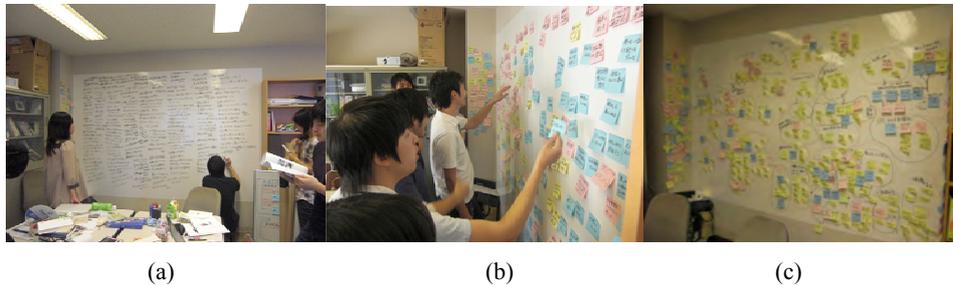
A summary of each pattern in the *learning patterns* is presented in the Appendix of this paper.

The *learning patterns* were developed for students who study at the Faculty of Policy Management and the Faculty of Environment and Information Studies, Keio University, as a guide to learn how to learn. These faculties have implemented a unique curriculum that is interdisciplinary and non-graded. This means all undergraduate students can study any kind of academic area, for example, social innovation, public policy, global strategy, environment, life sciences, and information studies, regardless of their grades or experience. Therefore the students can choose the courses they take, and this means that they need to design their own learning. It is the reason why we made the *learning patterns* to support their learning design. For the purpose, we handed out the booklet of the *learning patterns* to all freshmen and held a workshop using the booklet.

To create the *learning patterns*, six students under my guidance mined patterns from their experiences in 2008. The project facilitated discussion on learning skills based on their own experience of learning in the brain-storming-like style. A member would write down rules, methods, tips, or customs that they think are important about the subject onto a sticky note, talk about it briefly to the group, and then place the note on a large sheet of craft paper. Participants would take turns in no specified order talking about their notes until no one has any more ideas to express. The members gave positive feedback when other members shared their ideas during the brainstorming stage. The group provided words of agreement, understanding, add-ons, and approval. As a group, sometimes we thought and talked about the curriculum, sometimes about school life.

The six-hour session resulted in about 300 elements that the participants thought were important tips about learning [Figure 3(a)]. After that, the project held a visual clustering session for ten hours, where discussion about the elements helped to organise them into creative learning patterns [Figure 3(b)], and consequently we obtained about 50 candidates for patterns [Figure 3(c)]. After writing and revising them, we finally got 40 patterns describing practical knowledge for learning.

Figure 3 Collaborative pattern mining for creating the *learning patterns* (see online version for colours)



3.1 Experience mining with the *learning patterns*

The dialogue workshops using the *learning patterns* have been held at the Faculty of Policy Management and Faculty of Environment and Information Studies, Keio University, since 2011. Almost all freshmen at the two faculties – over 3,000 students in total – have participated in the workshop, where they talk about their experiences of learning in light of the patterns (Figure 4).

Figure 4 The dialogue workshop with the *learning patterns* (see online version for colours)



As preparation for the workshop, each participant would make a list of patterns that he/she has already experienced, and choose five patterns that he/she wants to acquire in the near future. This preparation was assigned as homework under the following instructions. “Make a list of all patterns you have experienced from the *learning patterns*. Consider *learning* in a broad sense, including skill development of music, sports, hobby, social activities, and so on. Then, choose five patterns you want to acquire in the near future”.

In the workshop, each student would look for a person who has experienced the learning pattern that he/she wants to acquire, and listen to the experience of the learning. The instructions are follows: “Look for the person who has experienced the learning patterns you want to acquire. Listen to them describe their learning experience. On the other hand, share your experience of learning when you meet the people who want to acquire the learning patterns you have experienced”.

We observed that the pattern language functions to encourage participants to talk about their experiences, which they seldom talk about in their daily life. The following are reflection comments from the students who participated in the workshop. “The workshop helped me remember these past episodes – and more importantly – how much I could already do”, “At first I felt shy and didn’t want to talk as much, but soon it became

fun searching for people with patterns and talking to them,” and “I think the workshop gives its participants a good experience in that it gives us an opportunity to ask questions for our own growth, and then answer questions of others with our own experiences. Such an opportunity is hard to achieve in our daily conversations – especially with so many people.”

3.2 *Experience analyses with the learning patterns*

Let us move on to the analyses of the data. Figure 5 shows the proportion of the students who have experienced each pattern in 2012, 2013, and 2014, respectively. The participants are freshmen of the faculties, who had just entered the university; the number of the participants is 678 students in 2012, 871 in 2013, and 912 in 2014. The figure shows that the tendency of experiences related to the patterns are similar among these years. Also, it shows that all of the patterns in the *learning patterns* are experienced by a certain percentage of people, and therefore it implies that all patterns have been really experienced by others, not only by the pattern authors. From a different point of view, Figure 5 shows that there are a couple of patterns that only have a small number of students with experience of the pattern. The students who do not have experience with these patterns are also potential users of the pattern in this community. Recall that a pattern is not worth sharing if it is easy for everybody to do it, so to some extent, people who have not experienced the patterns is important for new learning.

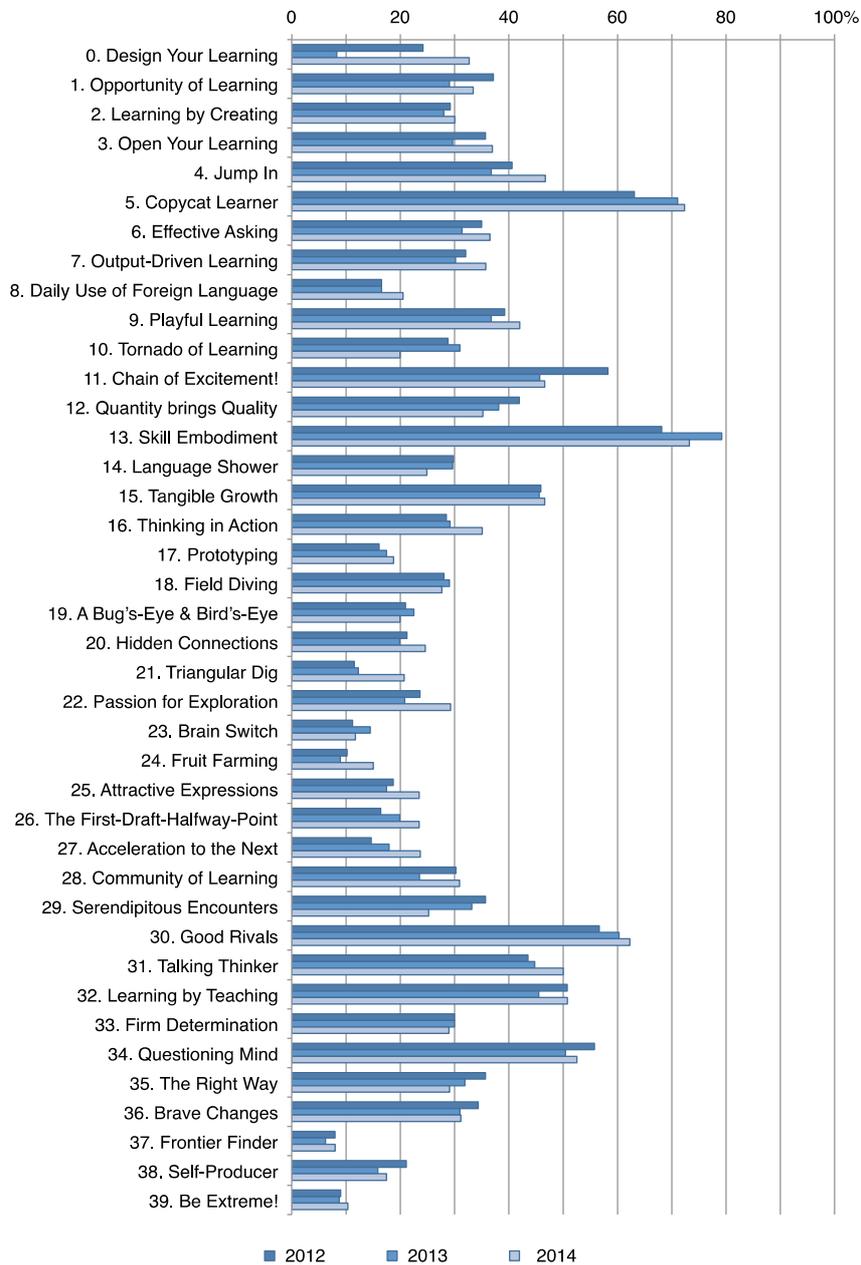
Next, Figure 6 shows how many participants chose each pattern as one of the five patterns that they want to acquire in the near future; the number of the participants is 699 students in 2012, 866 in 2013, and 875 in 2014. The fundamental tendency is similar among the years, while there are small differences. The figure also shows that there are more than a few demands for all patterns, indicating the potential for new users. Recall that a pattern is not worth sharing if nobody is interested in doing it in the future, so some amount of people who want to acquire a pattern is important.

3.3 *Experience visualisation with the learning patterns*

We can do further analysis with the patterns. For example, Figure 7 shows the co-occurrence network of patterns: a node indicates a pattern, and the link shows co-occurrence, meaning that the link is made between nodes if both patterns are experienced by the same person. As a result, we can see which patterns are experienced together based on the data.

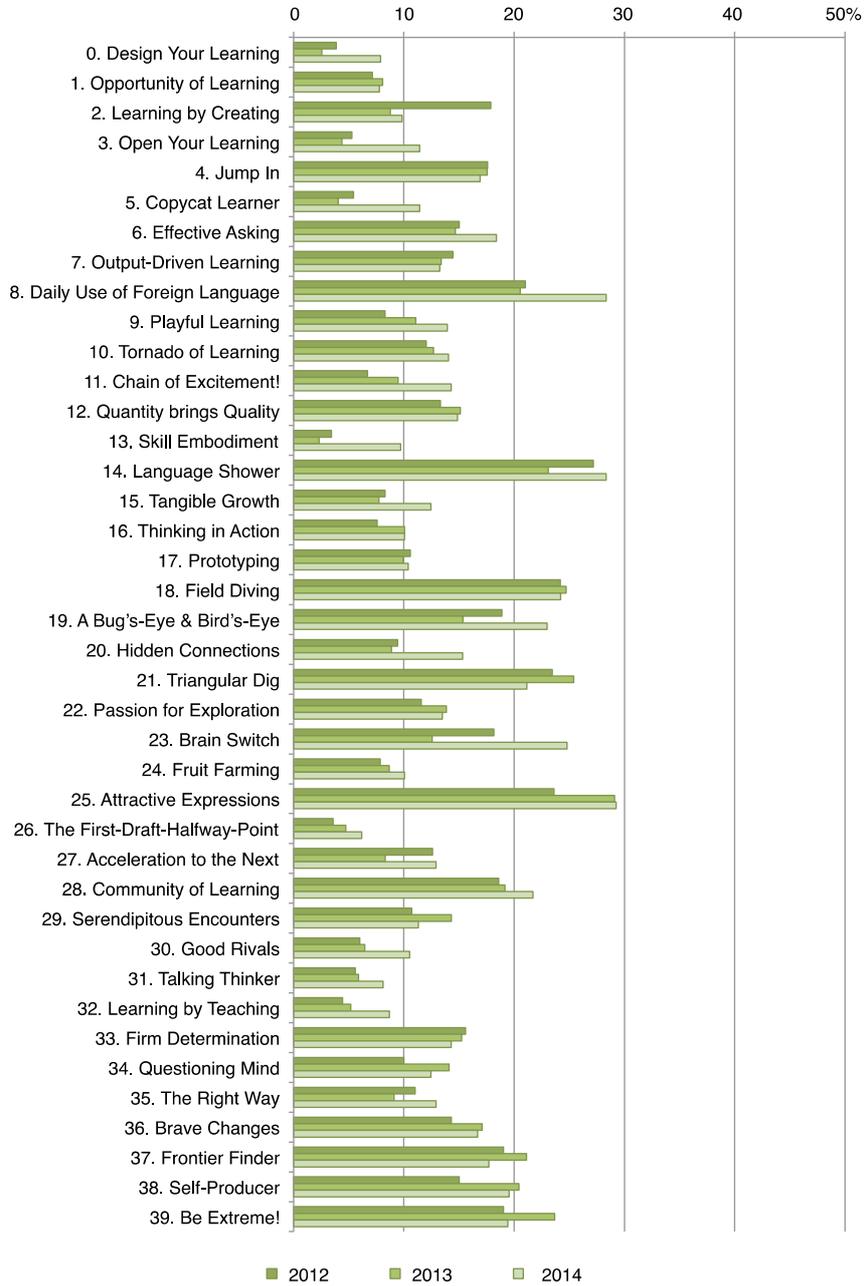
Another analysis is demonstrated in Figure 8, where the figure shows the change of experiences over time. Each plot shows the change of experiences within the same person in light of the *learning patterns*, comparing data from 2011 with 2014. In this way, we can capture the change of experiences with using pattern languages. A participant said in the feedback, “By watching this visualization, I realize that I have had lots of experiences that I have never had before. I’m really surprised at it and glad to feel my own growth.”

Figure 5 The proportion of participants who have experienced each pattern of the *learning patterns* (see online version for colours)



Note: N = 678 in 2012, 871 in 2013, and 912 in 2014.

Figure 6 Number of participants who want to acquire each pattern of the *learning patterns* (see online version for colours)



Note: N = 699 in 2012, 866 in 2013, and 875 in 2014; asked to choose five patterns that they want to acquire in the near future.

Figure 7 Co-experienced patterns network of the *learning patterns*

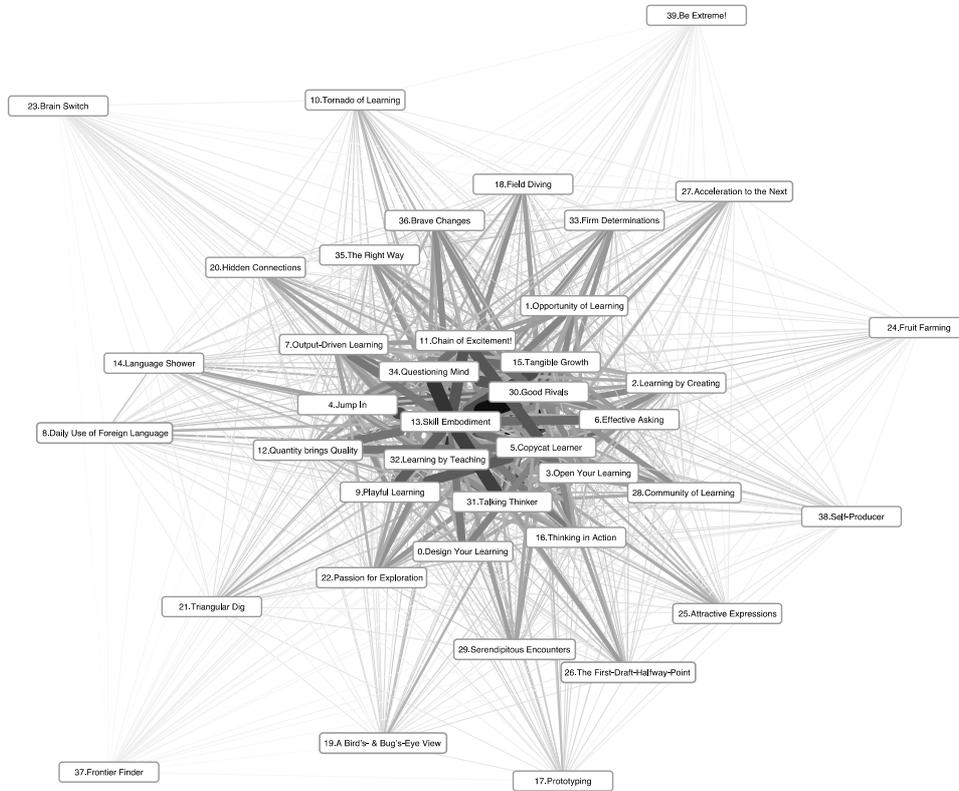
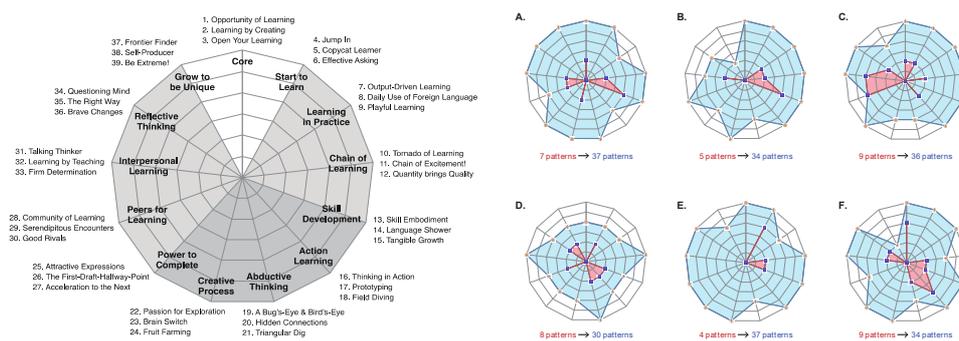


Figure 8 Charts expressing the change of experiences in the light of the *learning patterns* (see online version for colours)



4 Other cases: the presentation patterns and the collaboration patterns

Are the results showed above only for a single case – the case of the *learning patterns*? The answer is no. I here would like to show another two cases as follows: the case of the *presentation patterns* and the case of the *collaboration patterns*.

4.1 The presentation patterns

The *presentation patterns* are a pattern language for designing presentations (Iba et al., 2012a; Iba and Iba Lab, 2013). Although the word ‘presentation’ is used, it can be applied to all kinds of activities of representation, including public speaking, performance of music, drama, and dance. Seven students and I did the mining for the presentation patterns in 2011. In the element mining session, the project uncovered about 210 elements, which are what the participants thought were the important tips of presentation after a six-hour session. Then, the project held a visual clustering session for 12 hours.

As a result, we got 34 patterns describing practical knowledge for designing presentations as follows:

- 0 Creative Presentation
- 1 Main Message
- 2 Touching Gift
- 3 Image of Success
- 4 Storytelling
- 5 Exploration of Words
- 6 Visual Power
- 7 Dramatic Modulation
- 8 Unexpected Evolution
- 9 Doors of Mystery
- 10 Beautiful Clarity
- 11 Perfect Portion
- 12 Cherry on Top
- 13 Mind Bridge
- 14 Reality Sharing
- 15 Participation Driver
- 16 Quality in Details
- 17 Expression Coordinator
- 18 Discomfort Removing
- 19 Significant Void
- 20 Activation Switch

- 21 Take-Home Gift
- 22 Stage Building
- 23 Reminders of Success
- 24 Construction of Confidence
- 25 Presentership
- 26 Best Effort
- 27 Personally for You
- 28 Invitation to the World
- 29 Improvised Presentation
- 30 Reflecting Forwards
- 31 Unique Presenter
- 32 Aesthetics of Presenting
- 33 Be Authentic!

Figure 9 shows the proportion of the participants who have experienced each pattern in the *presentation patterns*, and Figure 10 shows how many participants chose each pattern as one of the five patterns that they want to acquire in the near future.

Figure 9 Number of participants who have experienced each pattern of the *presentation patterns* (N = 212) (see online version for colours)

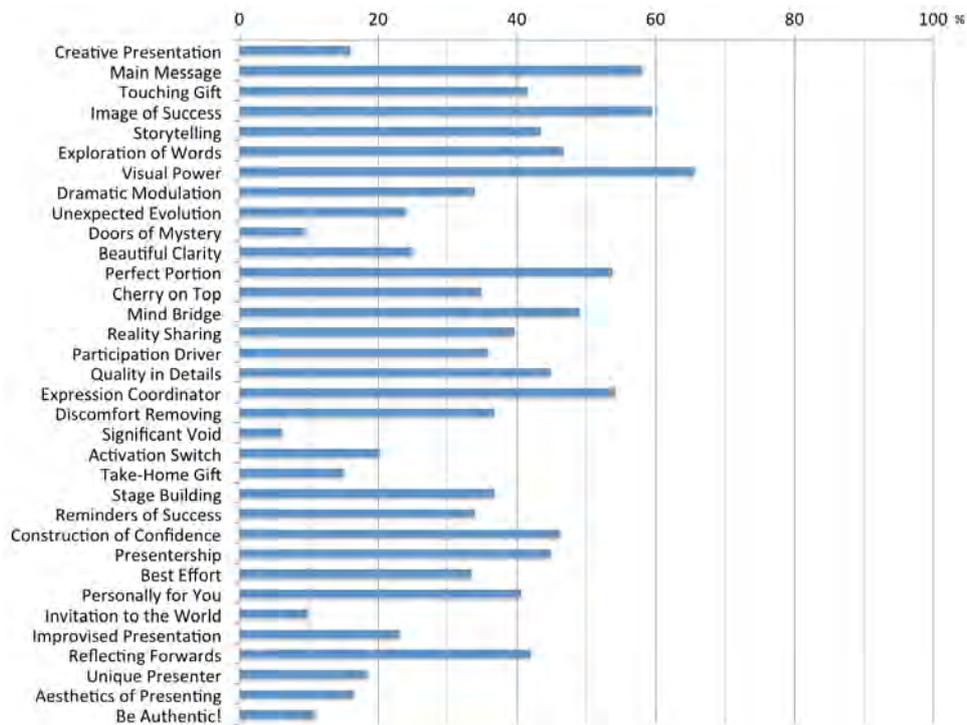
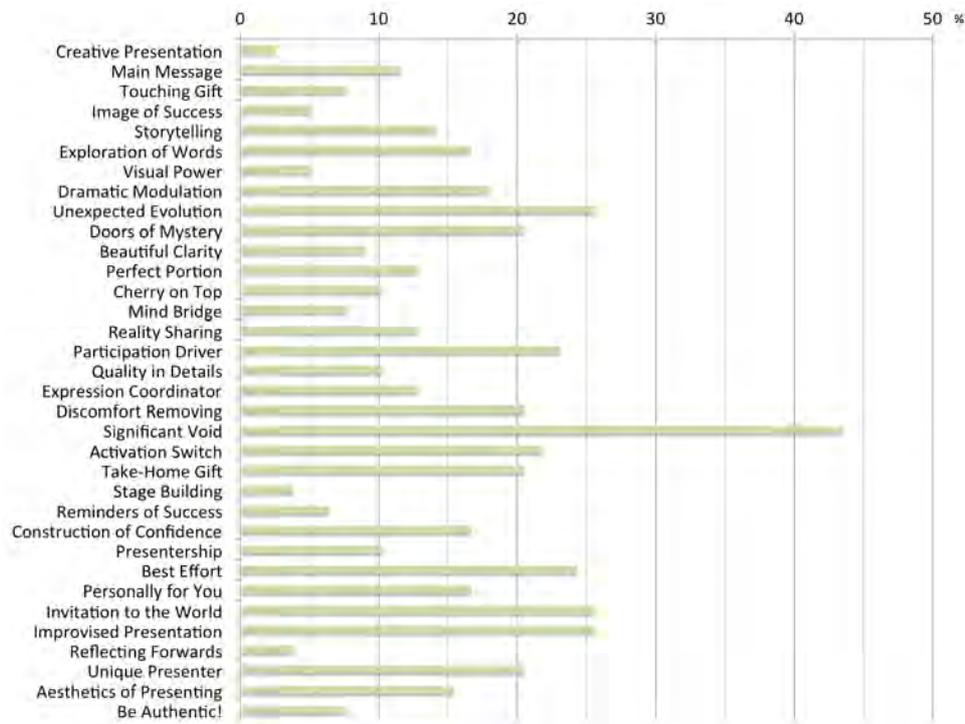


Figure 10 Number of participants who want to acquire each pattern of the *presentation patterns* (see online version for colours)



Note: N = 78; asked to choose five patterns that they want to acquire in the near future.

4.2 The collaboration patterns

The *collaboration patterns* are a pattern language for performing collaborations (Iba and Isaku, 2013). Fourteen students and I did the mining for the collaboration patterns in 2012. In the element mining session, the project uncovered about 360 elements, which are what the participants thought were the most important things to know about collaboration after an eight-hour session working together. Then, the project group conducted a visual clustering session for 20 hours.

As a result, we obtained 34 patterns describing practical knowledge for performing collaborations as follows:

- 0 Creative Collaboration
- 1 Mission for the Future
- 2 Innovation of the Ways
- 3 Create a Legend
- 4 Spiral of Growth
- 5 Sympathetic Union

- 6 Response Rally
- 7 Feeling of Togetherness
- 8 Piece to Contribute
- 9 Return of Growth
- 10 Spontaneous Commitments
- 11 Loose Connections
- 12 Vulnerability Disclosure
- 13 Words of Thanks
- 14 Vigour of Emergence
- 15 Loaf of Time
- 16 Collaborative Field
- 17 Activity Footprints
- 18 Chaotic Path to Breakthrough
- 19 Ideas Taking Shape
- 20 Inside Innovator
- 21 Roadmap to the Goal
- 22 Improvised Roles
- 23 Spadework for Creativity
- 24 Power to Change The World
- 25 Quality Line
- 26 Creative Clashes
- 27 Generative Destruction
- 28 Beyond Expectations
- 29 Project Followers
- 30 Strategic Developments
- 31 Context of the World
- 32 Endurance to Continue Creating
- 33 Polishing Senses.

Figure 11 shows the proportion of the participants who have experienced each pattern in the *collaboration patterns*, and Figure 12 shows how many participants chose each pattern as one of the five patterns that they want to acquire in the near future.

Figure 11 Number of participants who have experienced each pattern of the *collaboration patterns* (N = 183) (see online version for colours)

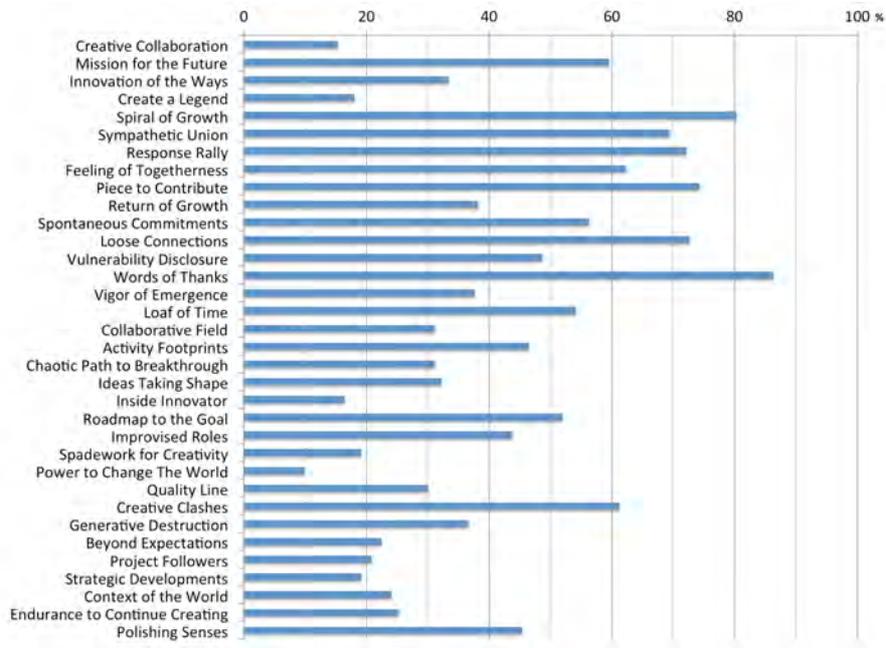
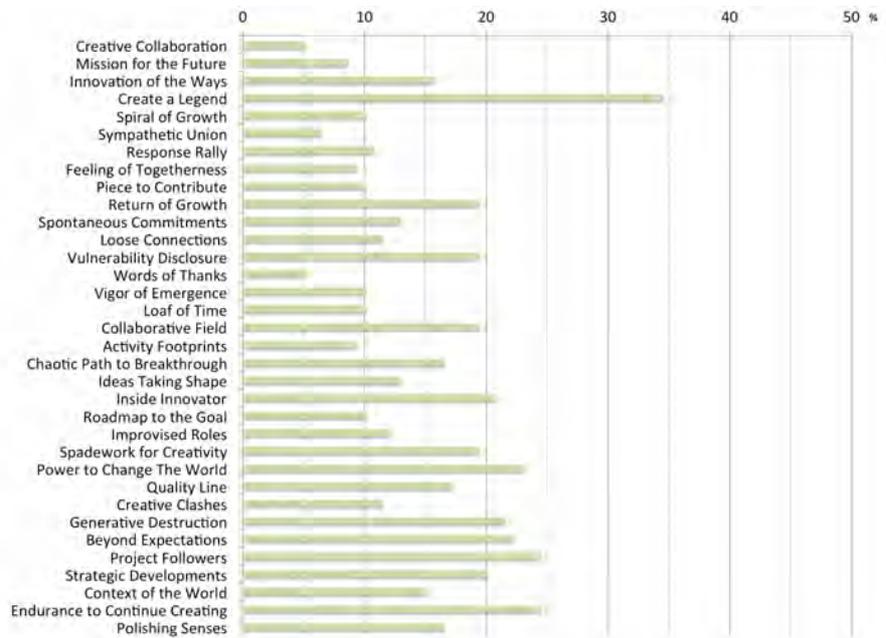


Figure 12 Number of participants who want to acquire each pattern of the *collaboration patterns* (see online version for colours)



Note: N = 139; asked to choose five patterns that they want to acquire in the near future.

5 Conclusions

This paper proposed new usage of pattern languages for mining, analyses, and visualisation of learning through experience. The examples shown in this paper demonstrated that pattern languages can be used as media for mining, analysing, and visualising and sharing tacit knowledge gained through practice in everyday life. My hope is that this study will inspire others to try using pattern languages to facilitate the discovery and sharing of knowledge of everyday learning. Such knowledge has the potential to benefit individuals and communities in the search for practical solutions to the problems of everyday life.

Acknowledgements

I would like to thank the reviewers for giving comments for improving this paper. I also want to thank to Taichi Isaku and Sumire Nakamura for helping improving this paper. Additionally, my greatest honour goes to all members of the Learning Patterns Project, Presentation Patterns Project, and Collaboration Patterns Project for their valuable work.

References

- Alexander, C. (1979) *The Timeless Way of Building*, Oxford University Press, New York.
- Alexander, C., Davis, H., Martinez, J. and Corner, D. (1985) *The Production of Houses*, Oxford University Press, New York.
- Alexander, C., Ishikawa, S., Silverstein, M., Jacobson, M., Fiksdahl-King, I. and Angel, S. (1977) *A Pattern Language: Towns, Buildings, Construction*, Oxford University Press, New York.
- Anthony, D.L.G. (1996) 'Patterns for classroom education', in Vlissides, J.M., Coplien, J.O. and Kerth, N.L. (Eds.): *Pattern Languages of Program Design 2*, Addison-Wesley, Boston.
- Arao, R., Tamefusa, A., Kadotani, M., Harasawa, K., Sakai, S., Saruwatari, K. and Iba, T. (2012) 'Generative beauty patterns: a pattern language for living lively and beautiful', in the *19th Conference on Pattern Languages of Programs (PLoP2012)*.
- Beck, K. and Cunningham, W. (1987) 'Using pattern languages for object-oriented programs', *OOPSLA-87 Workshop on the Specification and Design for Object-Oriented Programming*.
- Bergin, J. (2000) 'Fourteen pedagogical patterns', in the *15th Conference on Pattern Languages of Programs (EuroPLoP 2000)*.
- Bergin, J., Eckstein, J., Manns, M.L. and Sharp, H. (2011) 'Patterns for active learning', in the *16th Conference on Pattern Languages of Programs (EuroPLoP 2011)*.
- DeLano, D.E. (1998) 'Patterns mining', in Rising, L. (Ed.): *The Patterns Handbook: Techniques, Strategies, and Applications*, Cambridge University Press, Cambridge.
- Furukawazono, T., Seshimo, S., Muramatsu, D. and Iba, T. (2013a) 'Designing a pattern language for surviving earthquakes', in the *4th International Conference on Collaborative Innovation Networks (COINs2013)*.
- Furukawazono, T., Seshimo, S., Muramatsu, D. and Iba, T. (2013b) 'Survival language: a pattern language for surviving earthquakes', in the *20th International Conference on Pattern Language of Programs (PLoP2013)*.
- Gabriel, R.P. (1996) *Patterns of Software Tales from the Software Community*, Oxford University Press, New York.

- Gabriel, R.P. (2002) *Writer's Workshops & the Work of Making Things: Patterns, Poetry ...*, Addison-Wesley, Boston.
- Gamma, E., Helm, R., Johnson, R. and Vlissides, J. (1994) *Design Patterns: Elements of Reusable Object-Oriented Software*, Addison-Wesley, Boston.
- Hoover, D. and Oshineye, A. (2009) *Apprenticeship Patterns: Guidance for the Aspiring Software Craftsman*, O'Reilly Media, Sebastopol.
- Iba, T. (2011a) 'Pattern Language 3.0 methodological advances in sharing design knowledge', in the *International Conference on Collaborative Innovation Networks 2011 (COINs2011)*.
- Iba, T. (2011b) 'Experience mining and dialogues workshop with a pattern language for creative learning', *Workshop, in the International Conference on Collaborative Innovation Networks 2011 (COINs2011)*.
- Iba, T. (2011c) 'Experience mining and dialogues workshop with the learning patterns', in the *2nd Asian Conference on Pattern Languages of Programs (AsianPLoP2011)*.
- Iba, T. (2012) 'Pattern Language 3.0: writing pattern languages for human actions', Invited Talk, in the *19th Conference on Pattern Languages of Programs (PLoP2012)*.
- Iba, T. and Iba Lab (2013) *Presentation Patterns: Souzouwo Yuhatsusuru Hyogen no Hint [Presentation Patterns: A Pattern Language for Designing Creative Presentations]*, in Japanese, Keio University Press, Tokyo.
- Iba, T. and Isaku, T. (2013) 'Collaboration patterns: a pattern language for creative collaborations', in the *18th Conference on Pattern Languages of Programs (EuroPLoP 2013)*.
- Iba, T. and Miyake, T. (2010) 'Learning patterns: a pattern language for creative learners II', in the *1st Asian Conference of Pattern Language of Programs (AsianPLoP2010)*.
- Iba, T. and Sakamoto, M. (2011) 'Learning patterns III: a pattern language for creative learning', in the *18th Conference on Pattern Languages of Programs (PLoP2011)*.
- Iba, T., Ichikawa, C., Sakamoto, M. and Yamazaki, T. (2011) 'Pedagogical patterns for creative learning', in the *18th International Conference on Pattern Languages of Programs (PLoP2011)*.
- Iba, T., Matsumoto, A. and Harasawa, K. (2012a) 'Presentation patterns: a pattern language for creative presentations', in the *17th European Conference on Pattern Languages of Programs (EuroPLoP2012)*.
- Iba, T., Shimomukai, E., Nakamura, S., Isaku, T. and Tamefusa, A. (2012b) 'Dialogue workshop using the learning patterns', in the *19th Conference on Pattern Languages of Programs (PLoP2012)*.
- Iba, T., Miyake, T., Naruse, M. and Yotsumoto, N. (2009) 'Learning patterns: a pattern language for active learners', in the *16th Conference on Pattern Languages of Programs (PLoP2009)*.
- Isaku, T., Yamazaki, K. and Iba, T. (2013) 'Pattern diagnostic system: a diagnostic approach to pattern applications', in the *20th Conference on Pattern Languages of Programs (PLoP2013)*.
- Kawakita, J. (1967) *HassouHou [The Abduction Method: For Creativity Development]*, in Japanese, Chuo-Koron, Tokyo.
- Köppe, C. (2011) 'Continuous activity: a pedagogical pattern for active learning', in the *16th European conference on Pattern Languages of programs (EuroPLoP2011)*.
- Manns, M.L. and Rising, L. (2005) *Fearless Change: Patterns for Introducing New Ideas*, Addison-Wesley, Boston.
- Matsuzuka, K., Isaku, T., Nishina, S. and Iba, T. (2013) 'Global life patterns: a methodology for designing a personal global life', in the *4th International Conference on Collaborative Innovation Networks (COINs2013)*.
- Nakada, M., Kamada, A. and Iba, T. (2013) 'Personal culture patterns – a pattern language for living with continuous self-fulfillments', in the *18th European Conference on Pattern Languages of Programs (EuroPLoP2013)*.
- Pedagogical Patterns Editorial Board (2012) *Pedagogical Patterns: Advice for Educators*, Createspace, San Bernardino, CA.

- Peirce, C.S. (1992) *The Essential Peirce: Selected Philosophical Writings (1867–1893)*, Indiana University Press, Bloomington, IN.
- Peirce, C.S. (1998) *The Essential Peirce: Selected Philosophical Writings (1893–1913)*, Indiana University Press, Bloomington, IN.
- Shibuya, T., Seshimo, S., Harashima, Y., Kubota, T. and Iba, T. (2013) ‘Educational patterns for generative participant – designing for creative learning’, in the *20th International Conference on Pattern Language of Programs (PLoP2013)*.
- Shimomukai, E., Nakamura, S. and Iba, T. (2012) ‘Change making patterns: a pattern language for fostering social entrepreneurship’, in the *19th Conference on Pattern Languages of Programs (PLoP2012)*.

Notes

- 1 The term ‘pattern language’ consists of two words, ‘pattern’ and ‘language’. The first word ‘pattern’ derives from its concept where common pattern is discovered from what has good quality. The second word ‘language’ derives, on the one hand, from the idea that patterns forms a language system consisting of a set of elements, a set of rules, and semantic connections (Alexander, 1979). On the other hand, it also derives from its function as common language for designing, namely the patterns can be used as vocabulary for thinking and conversation.

Appendix

Summary of the learning patterns

The patterns in the *learning patterns* are all written in the same certain format: pattern name, introductory sentence, illustration, quotes, context, problem, force, solution, action, and consequence. In what follows, the context, problem, and solution statements of each pattern are presented as a summary. The pattern name gives the pattern a short and memorable name that well describes the pattern so it could be easily referenced. The context describes the conditions for when illustrators should apply this pattern. The problem describes a difficulty that often occurs in the context and is not easy to overcome. And, the solution describes how to solve the problem, with actions offering concrete methods to put the solution into practice.

- 0 *Design Your Learning*: You have recognised that continual learning is an essential activity in a complex and fluid society. *In this context*, it is not easy to learn how to learn. *Therefore*, learn the way of learning from the *learning patterns*, which will help you achieve good methods for learning.
- 1 *Opportunity of Learning*: You are ready to learn, perhaps having some expectations. *In this context*, there are few good opportunities for learning compared with your expectations. *Therefore*, make opportunities for learning by yourself, based on your interests.
- 2 *Learning by Creating*: You have started to learn, and maybe you want more excitement. *In this context*, you are unwilling to learn just by acquiring knowledge and skills. *Therefore*, launch your own project and carry it out to improve your knowledge and skills.

- 3 *Open Your Learning*: You have already learned to some extent, and you want to deepen your learning. *In this context*, learning tends to be closed. It is difficult to deepen your understanding only by yourself. *Therefore*, share your learning process and collaborate with others to deepen each other's learning.
- 4 *Jump In*: You have already found the new environment that you wish to be in and about to start a new challenge. *In this context*, you are still doubtful whether the community is really suitable for you. *Therefore*, jump into a new environment to learn something new.
- 5 *Copycat Learner*: You have just started to learn new skills, maybe after doing *jump in* (no. 4). *In this context*, it is difficult to find your own way from the beginning. *Therefore*, begin by imitating the ways of others to learn.
- 6 *Effective Asking*: You got stuck, and you cannot figure out the way to go forward by yourself. *In this context*, it is difficult to get the right answers when you ask vague questions. *Therefore*, clarify where you got stuck and then seek advice.
- 7 *Output-Driven Learning*: You are working on acquiring new knowledge and skills. *In this context*, it is difficult to keep learning if the necessity is unclear. *Therefore*, create an output in order to acquire knowledge and improve your skills.
- 8 *Daily Use of Foreign Language*: You have recognised that you need to read, write, or speak in a foreign language in the near future. *In this context*, it is difficult to read, write, and speak in a foreign language without any practice. *Therefore*, engage yourself in reading, writing and speaking in a foreign language in your daily life.
- 9 *Playful Learning*: You find yourself bored by the process of learning. *In this context*, learning as a duty is ineffective and painful. *Therefore*, take 'play' into the process of learning.
- 10 *Tornado of Learning*: You have found that there are a lot of resources, for example, books, articles, and courses, about what you are interested in. *In this context*, an effective learning is not brought about by passively receiving information. *Therefore*, collect information related to your interests like the vacuum of a tornado.
- 11 *Chain of Excitement!*: You have made some progress of learning, and perhaps you think that you have almost achieved your initial goal. *In this context*, it is not easy to keep active in explorations and studies. *Therefore*, the strong emotion of accomplishment will motivate your learning.
- 12 *Quantity Brings Quality*: You are realising that you have only a shallow understanding of what you are interested in. *In this context*, it is difficult to deepen your understanding more and more. *Therefore*, collect a lot of information about the target you wish to learn, and understand it from various angles.
- 13 *Skill Embodiment*: You want to acquire a skill, and maybe you have started to learn. *In this context*, it is not enough to memorise the 'how to'. *Therefore*, continue practicing a skill again and again until it becomes unconscious.
- 14 *Language Shower*: You want to have a good command of a foreign language. *In this context*, to master languages is tough. *Therefore*, setup an environment where you can always listen and read in a foreign language.

- 15 *Tangible Growth*: You need to continue practicing for acquiring *skill embodiment* (no. 13) or taking *language shower* (no. 14). *In this context*, it is not easy to keep yourself motivated to learn. *Therefore*, record the activities of your learning so you can reflect on your path and improve.
- 16 *Thinking in Action*: You have been studying by reading books, articles, or other written materials. *In this context*, it is difficult to get out of the situation when you become stuck. *Therefore*, deepen your thought process by making prototypes and doing fieldwork.
- 17 *Prototyping*: You have an idea and are almost ready to implement it. *In this context*, you cannot clarify an image of what you will create. *Therefore*, make some prototypes and consider how it can be made better.
- 18 *Field Diving*: You are thinking about and have an interest in an actual problem. *In this context*, you cannot touch upon reality only by referring to documents. *Therefore*, dive into the field and work with the people actually concerned while maintaining the viewpoint of an outsider.
- 19 *A Bug's-Eye and Bird's-Eye*: You are studying what you want to understand or working on creating an output. *In this context*, you have trouble improving the quality of an idea or the result that is mediocre. *Therefore*, take turns viewing the whole and the details.
- 20 *Hidden Connections*: You are studying something from typical points of view. *In this context*, unexpected discoveries hardly manifest themselves from a conventional classification. *Therefore*, explore hidden connections among things to attain inspiration.
- 21 *Triangular Dig*: You have been interested in something, but you have only a shallow understanding of it. *In this context*, you do not know how to develop your understanding of what you only roughly know. *Therefore*, acquire knowledge indirectly related to what you want to understand, and you will understand it better.
- 22 *Passion for Exploration*: After acquiring knowledge and improving skills, you finally need to decide the subject to explore from now on. *In this context*, it is hard to choose a subject for which you will be able to carry out an exploration. *Therefore*, choose a topic that you can be passionate about – something that you can feel ‘love’ or ‘passion’ in.
- 23 *Brain Switch*: You are creating an output, and you have had some progress. *In this context*, logical thinking is not enough to achieve a breakthrough without intuitive thinking, and vice versa. *Therefore*, switch between two modes of logical and intuitive thinking.
- 24 *Fruit Farming*: You are planning to create an output, but your vision might be too big. *In this context*, it is difficult to grow a big result at once. *Therefore*, do your best to put your idea into shape, and then nurture it.
- 25 *Attractive Expressions*: You are starting to make your presentation to share your idea or product with others. *In this context*, your idea/product seems not to be attractive to others. *Therefore*, find better ways of expression for attracting others.

- 26 *The First-Draft-Halfway-Point*: You are writing your ideas in order to share them with others. *In this context*, initial draft is not suitable to be read by others. *Therefore*, after finishing an initial draft, brush it up with an objective view to consider whether or not readers will be able to easily understand.
- 27 *Acceleration to the Next*: You are almost achieving your goal. *In this context*, your motivation is faltering even though the goal is within reach. *Therefore*, set and accelerate towards the next goal to pass through the current goal without slowing down.
- 28 *Community of Learning*: You have realised that what you are starting to work on is a challenging problem or activity. *In this context*, what you want to study is too big and too hard to explore alone. *Therefore*, build a community of learning with people who share similar interests.
- 29 *Serendipitous Encounters*: You want fellows to share and discuss the topics related to what you are interested in. *In this context*, there are few opportunities to meet people who have similar interests as you. *Therefore*, find people who have similar interests as you by getting involved in the field you are interested in.
- 30 *Good Rivals*: You have realised that you need to spend a lot of time for achieving your goal. *In this context*, it is difficult to keep making an effort alone. *Therefore*, make good rivals and inspire each other.
- 31 *Talking Thinker*: You have worked on developing your idea, but it is not so clear. *In this context*, thinking alone often brings you to a dead end. *Therefore*, explain what you think in verbal words to improve your idea.
- 32 *Learning by Teaching*: You have studied a certain topic to some extent so far. *In this context*, you have no idea how you can improve your superficial understandings. *Therefore*, teach others your knowledge while considering their levels, and you can gain an understanding on various levels.
- 33 *Firm Determination*: You are facing a challenge. *In this context*, it is too easy to give up on challenging activities. *Therefore*, firmly determine what you are going to do, and setup the environment to concentrating on it.
- 34 *Questioning Mind*: You have dedicated yourself to a certain activity. *In this context*, you cannot find any obvious reasons for what you are doing. *Therefore*, confirm your assumptions by questioning yourself again.
- 35 *The Right Way*: You are working on your activity in a certain way. *In this context*, the wrong way will lead you away from your goal. *Therefore*, consider whether your current way is actually correct or not; then quickly change your approach as necessary.
- 36 *Brave Changes*: You have just realised that there is not any clear purpose to your activity or that your current approach is inappropriate. *In this context*, there seems to be no solution to break through the current dilemma. *Therefore*, throw away previous themes or approaches to achieve a wider view for the future.

- 37 *Frontier Finder*: You have started to engage in your exploration. *In this context*, you have to know where the frontier of exploration is in order to conduct valuable activity. *Therefore*, Grasp the frontier of the field, and then acquire the knowledge needed to reach that line.
- 38 *Self-Producer*: You have had a clear goal and started to engage in your activity. *In this context*, it is difficult to design your career despite your attempts. *Therefore*, design a concrete plan to achieve your goal while inventing your future.
- 39 *Be Extreme!*: As a result of your dedication to activities, you have established a reputation for them. You, however, feel that it is not enough. *In this context*, in spite of your best effort, you and your results hardly see the light of day. *Therefore*, think strategically where you can/want to be distinguished from others.