

Pattern Writing as Reflection: Discussion on Pattern Writing as an Approach to Enhancing Reflection

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This paper presents pattern writing as an approach that enhances our reflection, by discussing how the thinking processes in pattern writing overlap with reflective thinking. Based on the pragmatist philosopher John Dewey (1859-1952), this paper considers reflection as the discovery of detailed connections between active and passive aspects of experience. It is argued that the thinking processes required for writing about a solution and problem in a pattern are precisely those of reflective thinking. This paper then introduces the idea that experimental practices are particularly valuable for reflection through pattern writing, describing this with two approaches: reflection on unexpected outcomes, both positive and negative. To demonstrate these claims, case studies illustrating reflection in personal daily practices and in team collaboration are presented. Finally, the paper discusses how focusing on pattern writing as reflection can be beneficial in learning contexts such as experiential learning.

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1. INTRODUCTION

The purpose of writing patterns can be considered to have two main aspects. Primarily, we write to capture and share essential and elusive knowledge in design and practice. Additionally, patterns are also written to facilitate communication, especially when pattern names serve as a common vocabulary. Considering Christopher Alexander (1936-2022)’s philosophy and the origins of pattern language, these purposes are consistent.

When we carefully examine these objectives, it becomes clear that the aim is to use patterns as tools in design and practice, meaning that the goal is to utilize the *written* patterns. From the perspective of a novice, written patterns represent a task of applying knowledge. For an expert, they serve as a means to convey their internalized knowledge to novices or non-experts. In this context, the activity of *writing* patterns is understood as a means subordinate to that purpose. However, those who have experience writing patterns know that this activity is not just a subordinate task; it holds significant importance. What, then, is this significance?

This paper argues that the significance lies in enhancing reflection. We term this concept *pattern writing as reflection*. It is natural to focus on reflection in the process of discovering and crafting patterns. For example, Kerth and Cunningham (1997) outlined introspection as one approach to investigating patterns, and Iba et al. (2017) described how deep reflection accompanies the clustering phase of identifying patterns.

In this paper, we use the term with reference to the reflective thinking of John Dewey (1859-1952), an American philosopher especially well-known for his discussions on human experience and education based on pragmatism. According to him, reflective thinking “is the intentional endeavor to discover specific connections between something which we do and the consequences which result” (Dewey 2024: 137): a type of thinking that has “value in the solidity, security, and fertility it affords our dealings with the future” (Dewey 2024: 142). We have previously discussed Dewey from a constructivist perspective in the context of pattern language (Iba and Burgoyne 2019). In this sense, this paper can be seen as a practical or methodological extension of that discussion.

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Therefore, this paper aims to examine the process and significance of pattern writing as reflection. Since the concept of practice aligns well with Dewey's theory, we focus on pattern languages of practices (Iba 2023) rather than of places or programs. As practice generally encompasses both individual and collective activities, this paper explores how pattern writing as reflection applies to daily practice and team collaboration.

The sections below proceed as follows: Section 2 introduces the idea of pattern writing as reflection, focusing on the thinking processes embedded in the act of writing patterns. Sections 3 and 4 explore case studies of this reflective approach, where the former focuses on reflection in individual daily practices, and the latter on reflection in team collaboration.

2. REFLECTIVE THINKING IN PATTERN WRITING

In this section, we first review how the thinking processes in pattern writing and reflection overlap. We then introduce the concept that experimental practices are particularly valuable for reflection through pattern writing, illustrating this by two approaches: reflection on results exceeding expectations and on problematic results beyond expectations.

2.1 Pattern Writing and Reflective Thinking

2.1.1 *The Essence of Pattern Writing*

It could be said that the core of pattern writing involves describing solutions and problems. According to Alexander, a pattern is expressed in a relation among three elements: a context, a problem, and a solution (Alexander 1979: 247). As the pattern language domain has expanded, the perspective of what constitutes essential elements of a pattern has evolved; for instance, there is a perspective that forces are considered a "mandatory" element (Meszaros and Doble 1997), and that emphasizes the inclusion of illustrations (Iba and Isaku 2016, Miyazaki et al. 2015). Nevertheless, it is undeniable that solutions and problems are fundamental in pattern writing. This idea also applies to Alexander, as evidenced by his description of the problem and solution sections enclosed within three diamonds as "the main body of the pattern" in *A Pattern Language* (Alexander et al. 1977: xi), indicating that he too viewed these two parts as the core.

In fact, a pattern is typically defined by first identifying a solution, and then a problem. Initially, when something is working well, we can identify what exactly it is and how it works (Alexander 1979: 249): this is the process of defining a solution. Next, we can consider why the idea is good. To answer that question, we can think about what would happen without the idea (Alexander 1979: 251). This thought process leads to the discovery of the problem. This sequence of thinking is essential to prevent patterns from falling into merely prescriptive solutions. As similarly pointed out in the process of pattern mining (Iba and Isaku 2016, Iba and Yoder 2014) and also incorporated into pattern writing, as seen in tools such as the pattern writing sheet (Iba 2014), this approach is understood as standard within the pattern language domain.

That said, this does not mean that the process of making patterns explicit is merely a simple task of filling out information according to the format of a pattern. As Alexander points out, what is important is the relationship between the elements (Alexander 1979: 253). These elements are not defined independently but are discovered within their relationships. Therefore, it is not sufficient to merely consider each element separately and pattern writing should not be seen as merely filling in the designated text boxes. There is a possibility of misunderstanding this if one is not familiar with pattern language, so emphasizing this point is crucial.

To clarify this idea, we argue that it is beneficial to focus not on the elements that should be included in a pattern but rather on the thinking processes required to identify those elements. By doing so, we can move away from viewing patterns merely as a format for describing knowledge and instead recognize the significance of the activity of writing patterns itself.

2.1.2 *Reflection: Discovering Connections between Active and Passive Aspects of Experience*

The concept that sheds light on the thought process of identifying the relationship between the solution and the problem in pattern writing is reflection in Dewey's philosophy.

In his exploration of the philosophy of education and learning, he elucidates the nature of experience. According to him, the nature of experience can be understood by noting that it includes active and passive elements peculiarly combined (Dewey 2024: 132). The active aspect involves our actions, what we do to something. Conversely, the passive aspect pertains to the consequences we undergo as a result of those actions. Dewey explains, "we do something to the thing and then it does something to us in return" (Dewey 2024: 132)

—— this “peculiarly combined” relationship means the connection between our actions and the outcomes they bring.

Following this line of thought clarifies what it means to “learn from experience.” To transform experience into knowledge, we must make a backward and forward connection between what we do to things and what we enjoy or suffer from things in consequence (Dewey 2024: 132). Without this association, our experiences remain transient, incidental events that fade away. In their unprocessed form, experiences offer nothing of value to inform future actions.

This is where reflection, or reflective thinking, comes into play. According to Dewey, it is distinct from merely recalling or remembering past experiences. Reflection involves capturing the connection between the active and passive aspects of experience. Moreover, Dewey emphasizes the importance of examining the details of this connection. It means delving into why a particular action leads to a specific result and understanding the process involved. Through such reflective thinking, experiences gain value as knowledge that can be applied to future situations.

2.1.3 Pattern Writing as Reflection

We should reconsider the patterns within this framework. To do so, we deliberately simplify and model Dewey’s argument to capture its essential structure. First, following Dewey, we can set up two axes. One axis represents the active aspects of experience, ranging from positive to negative. The other axis represents the passive aspects of experience, also ranging from positive to negative. Positive and negative mean the evaluation such as good and bad, joy and suffer. This creates a reflection matrix where experiences are categorized into four quadrants: positive active, negative active, positive passive, and negative passive (Fig. 1).

We can overlay the thinking that captures patterns onto this matrix: that is, we reinterpret a pattern’s solution and problem in terms of the activeness-passiveness and positivity-negativity of experience (Fig. 2). The solution of a pattern is what we do —— have done in the past or should do in the future —— to bring about positive outcomes; in other words, it involves considering the pathway from positive active to positive passive within this matrix (the red route in Fig. 2). The problem of a pattern can be seen as the problematic outcome we suffer, which is brought about by a negative active action (the blue route in Fig. 2), meaning we do not take the positive active action.

Since a pattern defines rules for actions that should be taken to determine whether the resulting consequences are good or bad (Alexander 1979: 182), it is reasonable to consider this alignment between Dewey’s matrix and pattern structure. Dewey himself refers to the relationship between the two as “the determination of a problem-solution” (Dewey 1938: 108), further supporting the validity of relating the solution and problem in a pattern to reflective thinking.

What we want to emphasize in this discussion is the following point. Pattern writers, to a greater or lesser extent, likely go through this kind of thinking process unconsciously when writing patterns. However, because it is done unconsciously, there is a possibility that to those unfamiliar with patterns, it may appear as merely a simple task of filling in a format. Therefore, it is valuable to clarify the thinking process involved in pattern writing: that thinking process is the reflection discussed above.

Therefore, pattern writing, which involves considering the relationship between the solution and the problem, requires the writer to engage in reflective thinking that discovers the connection between actions and their results: this paper argues that enhancing such thinking is the significance of pattern writing.

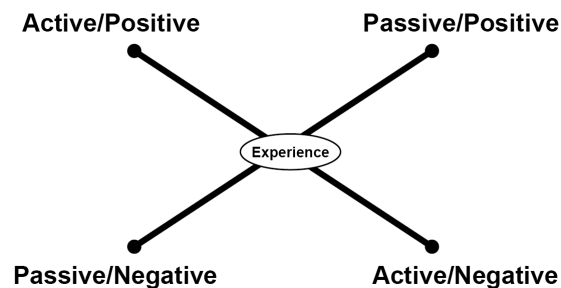


Fig. 1. Reflection matrix based on Dewey’s philosophy.

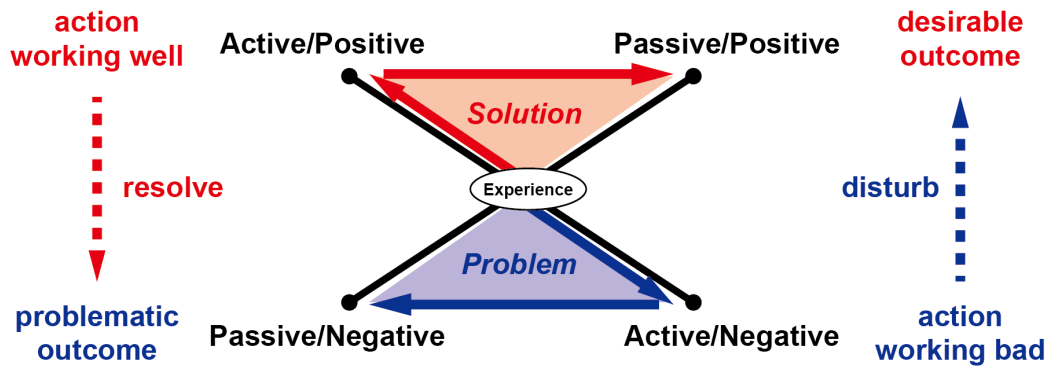


Fig. 2. The relationship between a pattern's problem and solution based on the reflection matrix.

2.2 Two Approaches for Reflecting on Experimental Practices in Pattern Writing

2.2.1 Experiences Worthwhile for Pattern Writing as Reflection: Experimental Practice

From the above discussion, we propose using pattern writing as an approach for reflecting on experiences. While many experiences can be reflected upon, it is valuable to consider which experiences are worthy of the effort of writing patterns.

In this paper, we consider *experimental practices* to be those experiences worth reflecting on. These practices refer to trial actions for knowledge production aimed at achieving a desired outcome. Experimental practices are valuable for reflection because analyzing the relationship between actions and outcomes, even if the knowledge gained is tentative, can generate ideas for retrying or improving the practice.

In the context of this paper, the emphasis on the experimentality of practice is due to the following reasons. Alexander states that patterns can be regarded as similar to “a hypothesis of science,” meaning that patterns are not universal truths but rather “current best guesses” (Alexander et al. 1977: xv). In this sense, when producing knowledge in the form of patterns, our actions can be seen as a kind of experiment to hypothesize patterns. Additionally, Dewey (1922, 2024) frequently uses terms such as “experimental,” “trial,” and “tentative” when discussing reflection, suggesting that this approach is well-suited to such activities. From the above, it can be considered meaningful to regard experimental practice as suitable for reflection in pattern writing.

If reflecting on experimental practices, two different approaches can be considered. One is reflection on unexpected positive outcomes, and the other is reflection on unexpected negative outcomes. Here, “unexpected” is emphasized because such unforeseen events and the feelings associated with them are considered to be the motivation for reflection. Reflecting on every experience is practically impossible, so it is appropriate to use the unexpectedness as a criterion for the emotions that drive reflection toward the knowledge captured in patterns. However, since the reflection process and focus differ depending on whether the unexpectedness is positive or negative, the following sections will discuss each in detail.

2.2.2 Reflection on Unexpected Positive Outcomes

When trying something, it is occasionally possible to achieve results that exceed expectations. Even if we have anticipated certain outcomes, it is often impossible to fully predict all potential outcomes in advance. Consequently, it is not uncommon to find that the results turn out better than expected. If we do not reflect on such experiences, we will not understand why they were successful, and they will remain one-shot fortunate occurrences. As a result, it becomes difficult to replicate the same results in similar situations, and it may even lead to undesirable outcomes. Therefore, situations where we have encountered unexpected positive outcomes are times when reflection is needed.

Reflecting through pattern writing allows us to discover the connection between the actions that led to these unexpected positive outcomes and the problematic outcomes that might have arisen if we had not taken those actions (Fig. 3). In other words, we can analyze the essential practices, i.e., the solution in the pattern, that contributed to achieving the results, and the problem in the pattern that could arise from not implementing those practices. By doing so, the necessary conditions for making those results work become clear, and we can understand what practices should be repeated to achieve similar positive outcomes.

The challenging and essential aspect of this reflection approach is identifying the problem in the pattern. This is because this approach is applied when good results have been achieved, meaning that no problematic outcomes have actually occurred. If we do not reflect just because no problematic outcomes have arisen, we may overlook the underlying logic of the practices that led to the good results. This oversight makes it a matter of chance whether we can replicate the same practices. Therefore, it is precisely when no problematic outcomes have occurred, and results have exceeded expectations, that reflection through pattern writing becomes most valuable. In other words, this type of reflection requires imagining potential problematic outcomes that were resolved by the practice.

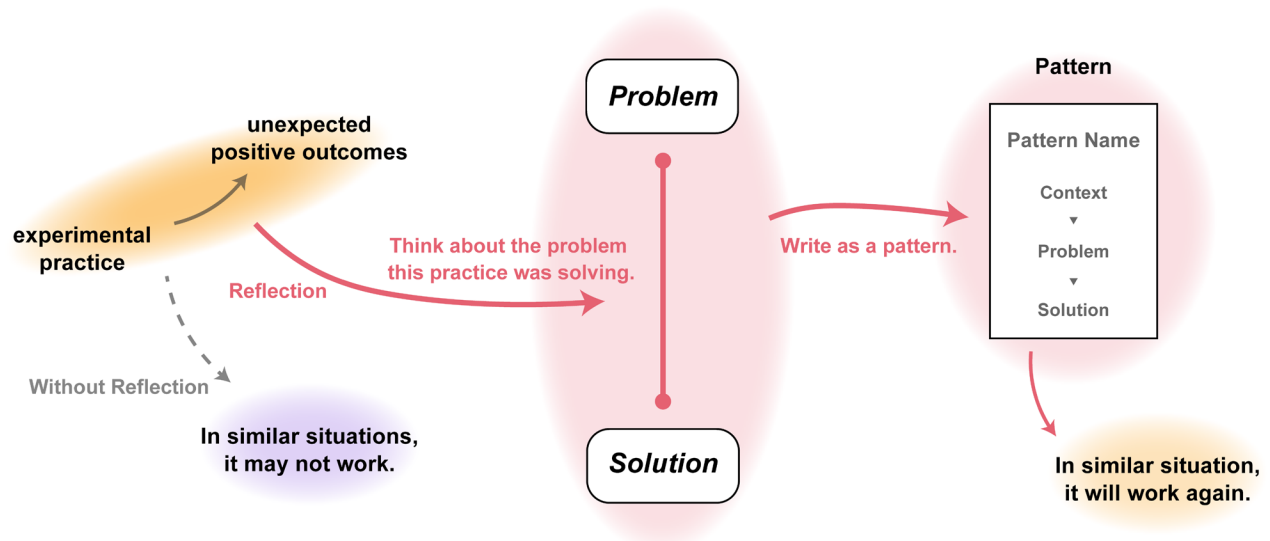


Fig. 3. Reflect on unexpected positive outcomes, identify the problem-solution connection, and write a pattern.

2.2.3 Reflection on Unexpected Negative Outcomes

Conversely, when trying something new, things can also go wrong. In trials where it is impossible to predict all outcomes, it is natural that some attempts will not work out. When we encounter problematic outcomes, we need to take action. However, merely continuing without reflection can lead to a haphazard approach, making it a matter of chance whether we achieve desirable outcomes. This is because, without reflection, we remain unclear about what exactly went wrong with the practice. Therefore, when problematic outcomes occur and we manage to address them, it is not enough to be satisfied with having handled them; it is time to analyze the series of events through reflection.

By reflecting through pattern writing, we can discover alternative ways to avoid the problematic outcomes we encountered and identify paths to more desirable results (Fig. 4). In other words, we analyze what went wrong in the trial in detail as a problem in the pattern and consider better approaches, i.e., solutions in the pattern. By thoroughly understanding the factors that led to these problematic results, we can gain insights into alternative approaches for avoiding them.

The challenging and essential aspect of this reflection approach is identifying the potential solutions in the pattern. In our view, considering solutions in the pattern is different from the so-called trial and error. This is because the solutions are ideas to prevent problems from occurring in the first place, not just responses to problems that have already occurred. While it is not necessary to run the experiment to write a pattern, the act of pattern writing itself encourages thinking and imagining new potential solutions. This process of reflection and writing is crucial because it allows us to prepare for future situations by having a repertoire of hypothetical solutions. Whether these solutions are truly effective will be verified when similar situations arise. By writing the patterns, we make it easier to remind ourselves of these hypothetical solutions and prepare to apply those ideas when the need arises. This is the goal of this type of reflection.

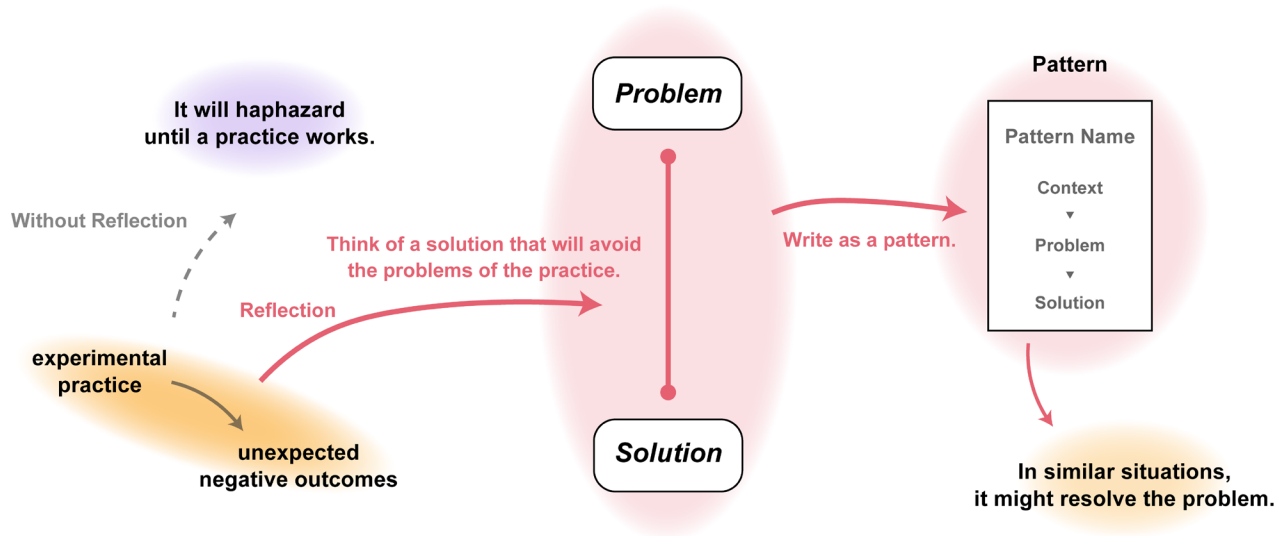


Fig. 4. Reflect on unexpected negative outcomes, identify the problem-solution connection, and write a pattern.

3. CASE STUDY OF REFLECTION ON PERSONAL DAILY PRACTICES

This section presents a case of reflecting on personal daily practices through pattern writing, as discussed in this paper. The following examples include two patterns written by the authors during reflections on daily practices. One pattern is an example of reflecting on unexpected positive outcomes, while the other focuses on unexpected negative outcomes and aiming for more desirable results. At the end of this section, we will discuss the insights gained from using pattern writing for reflecting on personal daily practices.

3.1 Introduction to the Cases

We, the authors, are currently engaging in reflection through pattern writing whenever something goes well or when we want to improve something in our daily lives. We make it easy to write patterns by jotting down simple notes in a notebook or creating files in a text editor. This allows us to reflect while the experiences are still fresh. Since we are familiar with writing patterns, we can approach it this way. However, those who are not familiar with pattern language may need support, such as using a pattern writing sheet (Iba 2014).

3.2 Patterns Written from Reflection on Daily Practices

Case 1. One of the authors, one day, left home for campus with not only the book she had to read for an assignment but also another book. Normally, she would only bring the assignment book, but that day, on a whim, she also tried bringing the additional book. On the bus ride to campus, she first picked up the second book and started reading it. Usually, when she tries to read on the bus, she becomes sleepy or distracted by her smartphone, making it hard to concentrate. However, on this day, she was able to focus on her reading. Because she was able to concentrate, she then decided to read the book she needed for her assignment and was able to focus on it just as well.

Then, she decided to reflect on this experience and write a pattern. This was because having not only the assignment book but also the second book allowed her to concentrate more than usual on her reading during the commute. In other words, for her, this experience was an experimental practice that brought positive results beyond her expectations.

From her reflection through pattern writing, the *Warm-Up Reading* pattern was written (Table 1). The process of her reflection was as follows. First, she considered what it meant to have the second book with her. She discovered that reading an easy-to-read book or a novel first served as a warm-up for reading a more difficult book. Thanks to this, she was able to concentrate on her reading on that day, something she usually struggled with. After discovering the relationship between this solution and the problem, she wrote the pattern. Since then, she has started carrying an easy-to-read book as a warm-up when she has particularly challenging reading assignments.

Case 2. Another author experienced disturbances from social media notifications and messages on their smartphone while concentrating on writing tasks, such as drafting a paper. Despite making temporary

adjustments, such as changing notification settings or scheduling specific times to respond, these measures were not a fundamental solution for maintaining focus during their work.

Therefore, he engaged in reflection to develop a pattern to address this situation. He realized that his approach was haphazard, relying on trial and error, leaving the success of his efforts to chance. As a result, the problematic situation was not resolved as effectively as he had expected. What was needed in this situation was to take a step back, thoroughly reflect, and identify the fundamental problem along with a solution to dissolve it.

The reflection brought about the *Off-Desk Charging* pattern (Table 2). The process of his reflection was as follows. He realized that when he picked up his smartphone to respond to notifications, he would end up checking social media or news, in addition to the messages. This led to spending unnecessary time beyond the brief responses, which disrupted his writing tasks. He recognized that relying solely on willpower to avoid looking at the smartphone would not be an effective solution. Therefore, the solution he came up with was to charge the smartphone in a different room from the study — such as the living room or bedroom. By doing so, it would be impossible to pick up the smartphone in the study, allowing him to focus solely on his work. Since this reflective pattern writing, he has practiced this pattern, especially when he needs to concentrate on writing.

Table 1. Reflection on the practice and its unexpected positive outcome led to the identification of the problem and its solution. Based on this reflection, the *Warm-Up Reading* pattern was written.

Reflection		Pattern
Practice and Unexpected Positive Outcome		<p><i>Warm-Up Reading</i></p> <p>There is a very difficult book that needs to be read for homework.</p> <p>▼</p> <p>In this context, attempting to read the book immediately can lead to a loss of concentration due to its challenging content, often resulting in feelings of sleepiness or distractions like checking a smartphone.</p> <p>▼</p> <p>Therefore, starting with a book that is relatively easy to read can serve as a warm-up to enhance concentration before tackling the difficult book.</p>
Carrying a second book different from the assignment book, and starting to read the former during the commute, led to improved concentration, making it possible to focus on and read the usually daunting assignment book as well.		
Problem	Solution	
If jumping into a difficult book straight away, it may lead to failure.	An easy-to-read book can serve as a warm-up for reading.	

Table 2. Reflection on the practice and its unexpected negative outcome led to the identification of the problem and its solution. Based on this reflection, the *Off-Desk Charging* pattern was written.

Reflection		Pattern
Practice and Unexpected Negative Outcome		<p><i>Off-Desk Charging</i></p> <p>There is a writing task that requires deep concentration.</p> <p>▼</p> <p>In this context, picking up the smartphone to respond to notifications often leads to unnecessary browsing of social media or news, disrupting the writing process.</p> <p>▼</p> <p>Therefore, charge the smartphone in a room separate from the study to prevent access to it during writing.</p>
Attempts were made to change the smartphone’s notification settings or set specific times for replying to messages, but it was unexpectedly difficult to concentrate on writing.		
Problem	Solution	
Even if notification settings and reply rules are set, picking up the smartphone triggers the temptation to browse social media or news, resulting in a distraction.	If the smartphone is not kept nearby around the desk, it becomes impossible to pick it up and browse.	

3.3 Discussion on These Cases: Forming New Habits

What interested us about reflecting on our daily practices and writing them into patterns was that it enabled us to turn experimental actions into new habits. Experimental practices can serve as a step to break away from old habits, but if they are performed only once, the change they bring about is merely temporary. By thoroughly understanding the relationship between the practice and its outcomes and documenting it as a pattern, we were able to clearly grasp the logic of the practice. Additionally, assigning a pattern name made it easier to remind ourselves of this practice. As a result, it appears that we were able to continuously perform the experimental practice, leading to the formation of new habits.

It is not surprising that forming habits can be achieved through the acquisition of patterns. There is a discussion that argues the philosophy of pattern language from the perspective of pragmatism (Iba and Yoshikawa 2016), stating that the purpose of pattern language is to help change and form habits. According to this argument, habits arise from certain beliefs. These beliefs are understandings of how to resolve situations that present doubts or problems. As discussed in our paper, writing patterns involves discovering the connection between problems and solutions, thus establishing certain beliefs. Therefore, by writing patterns, beliefs about how to handle certain situations are established, which helps in continuing the practice and forming habits. The cases discussed above suggest that reflection through pattern writing contributed to the change and formation of personal habits.

4. CASE STUDY OF REFLECTION IN TEAM COLLABORATION

This section describes a case where reflection through pattern writing was conducted in team collaboration. In collaborative activities, creating opportunities for reflection is essential, as sharing experiences among members through dialogue is crucial. Thus, this section illustrates how the team members reflected and wrote patterns while engaging in dialogue with each other. In this case study, two patterns are also presented, corresponding to each approach to reflection, just as in the previous section.

4.1 Introduction to the Cases

This case study focuses on the exhibition project of our laboratory at our university's research forum. The campus where the authors belong (Keio University Shonan Fujisawa Campus) hosts an annual research presentation event called *Open Research Forum* (hereafter referred to as ORF), and our laboratory has been participating every year. Our laboratory is dedicated to the exhibition project at the ORF, and to enhance the quality of collaboration and learning within the lab, we conduct reflections after the ORF has concluded.

Our laboratory conducted this reflection through pattern writing, as discussed in this paper. The reflection was carried out over 4-5 sessions (90 minutes per session) during laboratory meetings after the ORF. In the following sections, we first present the *Build First* pattern written in ORF 2022 as an example of reflection on positive outcomes. Then, we present the *Deadline before Deadline* pattern written in ORF 2023 as an example of reflection on negative outcomes.

4.2 Patterns Written from Reflection in Team Collaboration

Case 3. During the reflection on the 2022 exhibition project, it was discussed that almost all the necessary fixtures and items for the exhibition were built through digital fabrication. It was shared that this initiative was not originally started by members with fabrication skills. Nonetheless, a few members took the lead in acquiring these skills and mastering the campus's digital fabrication equipment, which they had not used before. Additionally, they were able to involve many members in the fabrication process, resulting in the building of attractive items.

For the lab, this experience seemed worth documenting as a pattern. The spirit of challenge in wanting to build using digital fabrication led to collaboration within the lab that exceeded expectations. If this had not been a reflection aimed at writing a pattern, the reflective dialogue would have been limited to praising the contributing members and being remembered merely as a good memory for the lab.

Thus, the *Build First* pattern was written (Table 3). The important aspect of this reflection was identifying a potential problem that did not actually occur in this activity — namely, the problematic result of missing the opportunity to build things ourselves by trying to buy them immediately. This attitude would contradict the philosophy of our lab. By discovering the relationship between this problem and its solution, it becomes possible to choose *Build First* along with its rationale, even if there is no one to suggest “let’s build it ourselves” the following year. As a result, the reasons for the success of this practice can be preserved as practical

knowledge that can be utilized in future opportunities, without being solely attributed to the members who contributed at this time.

Case 4. In the reflection dialogue on the 2023 exhibition project, it was discussed that the data submission for the exhibition panels was close to the deadline. It was shared that the data completion was delayed in the first place, which resulted in the inability to share and consult with the entire research group about the materials being created. Nevertheless, a few members managed to submit the data at the last minute through their efforts.

This episode also seemed worth documenting as a pattern for our lab. Although we managed to meet the submission deadline this time, it was undeniably last-minute and haphazard, and the same approach might not succeed next time. During the dialogue, there was an opinion that “we should have started earlier,” but concluding the reflection with just this would not yield a fundamental idea to prevent the same problematic situation from arising again. What we recognized as more noteworthy during the dialogue was not the fact that we somehow managed to meet the deadline this time, but rather that this-time practice led to unexpectedly problematic outcomes, and our success this time was just haphazard.

The *Deadline Before Deadline* pattern was created through further reflection (Table 4). During the process, it was identified that the true problem to avoid was “not having enough time to share and confirm with everyone” due to approaching the deadline, and ways to prevent this were considered. As a result, it was determined that simply “starting early” or “working hard” was not a fundamental solution. Instead, the idea of “setting a deadline for sharing and confirming with other lab members before the submission deadline, rather than aiming for the submission deadline itself” was conceived. Thanks to reflection through pattern writing, the connection between the fundamental problem and its solution was discovered, allowing us to identify a method to avoid such issues in future ORF projects.

Table 3. Reflection on the practice and its unexpected positive outcome led to the identification of the problem and its solution. Based on this reflection, the *Build First* pattern was written.

Reflection		Pattern
Practice and Unexpected Positive Outcome		<p><i>Build First</i></p> <p>There are fixtures and items needed for the exhibition.</p> <p>▼</p> <p>In this context, thinking only about purchasing the items needed for the project might lead to missing the opportunity to expand creative experiences and abilities.</p> <p>▼</p> <p>Therefore, when there is a need for fixtures or items, first ask, “Couldn't they be built?” and explore the approach of building them ourselves as much as possible.</p>
Most of the fixtures and items needed for the exhibition were created by ourselves using digital fabrication equipment.		
Problem	Solution	
If fixtures or items are purchased, the opportunity to develop the experience and ability of building them is lost.	Choosing to build them ourselves will develop our experience and skills in building.	

Table 4. Reflection on the practice and its unexpected negative outcome led to the identification of the problem and its solution. Based on this reflection, the *Deadline Before Deadline* pattern was written.

Reflection		Pattern
Practice and Unexpected Negative Outcomes		<p><i>Deadline Before Deadline</i></p> <p>There are materials that need to be submitted to a vendor.</p> <p>▼</p> <p>In this context, if the materials are completed just before the deadline, there will not be enough time to share and confirm with other laboratory members to make improvements.</p> <p>▼</p> <p>Therefore, set a deadline for sharing with everyone before the submission deadline to the vender, and work towards that deadline.</p>
The materials were made in an attempt to meet the submission deadline to the vendor, but it ended up being very last-minute.		
Problem	Solution	
If it becomes truly last-minute, it becomes impossible to share the materials with other members and receive feedback for improvements.	Set a deadline that allows enough time to share the materials with other members and receive feedback.	

4.3 Discussion on These Cases: Enabling Organizational Learning

What was interesting about reflecting on team collaboration through pattern writing was that some of the difficulties we felt in reflecting in a team were resolved. One of these difficulties was attributing the reasons for success to members. While it is certainly important to respect those who contributed, if successful practices depend on specific members, it becomes impossible to achieve the same good results when those members are not present. Another difficulty was the tendency to consider temporary fixes as solutions to the problem. When a problem arises, we respond in some way, but these responses are often just temporary measures. Without a fundamental understanding of the problem, the same issue is likely to arise again.

Both of these difficulties arose because we were not getting to the core of our experiences: by approaching our reflections through pattern writing, which focuses on the problem-solution relationship, we were able to avoid these pitfalls. Overcoming these difficulties is crucial because it enables us to cultivate and pass on shared knowledge within the team. In any organization or team, member turnover is inevitable, and without thorough reflection, shared knowledge cannot be passed on, causing organizational learning to fail. This case made us realize that reflection through pattern writing can enhance the team's reflection capabilities, thereby making organizational learning more effective.

5. CONCLUSION

In this paper, we discussed how pattern writing overlaps with reflective thinking and illustrated that reflection can be enhanced through pattern writing. The core of pattern writing lies in understanding the connections between problems and solutions, which is precisely what reflective thinking aims to uncover. The paper particularly argued that experimental practices are worth reflecting on through pattern writing, and illustrated the process of reflection using two approaches. As examples, we examined reflections on individual daily practices and team collaboration, exploring what they could bring about. Consequently, we showed that reflection through pattern writing can help change and form individual habits and contribute to the inheritance of good practices within the community.

One of the unique aspects of writing patterns as a reflection approach is assigning pattern names to the reflection. If the goal is simply to reflect on experiences, similar outcomes might be achieved using other reflection frameworks, such as KPT (Keep-Problem-Try), which is known in agile development. On the other hand, assigning pattern names to the reflection makes it easier to conceptualize and utilize as knowledge, facilitating recall and communication. This is where the strength of pattern language can be fully leveraged. While this paper has consistently focused on the relationship between problems and solutions in patterns, this does not mean overlooking the importance of pattern names.

Based on the characteristics of patterns written from reflection, we can consider the implications of this proposal. These patterns, as shown in this paper, are based on practices conducted in an ad-hoc manner. In other words, the patterns are written about practices that are not yet confirmed as best practices. Patterns in pattern language represent universal knowledge and ideas that repeatedly appear in various contexts. Patterns are written with the aim of achieving such universality. In this sense, writing about practices that were tried out experimentally as patterns might be seen as unconventional.

However, we believe that by continuing the cycle of practice and reflection through pattern writing, we can gradually discover both better practices and patterns. It is not necessary to wait until a practice can be deemed a best practice to write it as a pattern. Rather, writing patterns enhances reflection, enabling us to think about and implement better practices. In other words, pattern writing opens the path for the exploration of better practices. This path, we argue, holds a unique significance from writing patterns based on best practices.

In this sense, the discussion in this paper can be seen as part of the broader discourse on experiential learning. Experiential learning is one of the learning theories based on a constructive view of learning. Among these, Kolb's model (Kolb 2015) of the experiential learning cycle is particularly well-known. In this model, the challenge of effectively resolving the dialectical tension between *Active Experimentation* and *Reflective Observation* is discussed as one of the keys to effective learning. The argument of this paper, which discusses reflection through pattern writing based on experimental practices, can be seen as an approach to realizing a part of this model. Viewing pattern language from this perspective allows us to see it not only as a tool to support design but also as a means to support our learning, and we can further explore this aspect. This paper represents one such attempt.

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