

A review of the frameworks for assessing the reflective journal of a novice materials designer

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Abstract

In education contexts, reflection is useful for teacher training and education management for professional growth. However, it is also an important ability for teachers and reflective practitioners who are interested in self-development. As a novice materials designer, my reflective journal recorded the steps taken in designing classroom materials under the topic of writing e-mails. In order to analyze reflections, many researchers have proposed various tools of the assessment of reflective journal. This article will review three frameworks used to assess reflection: (1) content and form, (2) content and depth, and (3) the inventory of reflective thinking via action research (IRTAR). The comparisons between these three methods will be done to identify the appropriate framework to analyze my own reflective journal.

1. Reflection

1.1 Definition of reflection

The definitions of reflection have been changed over time since researchers adopted various theoretical frameworks for reflective thinking. Dewey (1933) elaborated upon reflective thinking as one particular type of thought which is “active, persistent, and careful consideration of any belief or supposed form of knowledge in light of the grounds that support it and the future conclusions to which it tends”. Meanwhile, other researchers (Boud, Keogh, & Walker, 1985) stated that reflection is “a generic term for those intellectual and affective activities in which individuals engage to explore their experiences in order to lead to new understandings and appreciation”.

Later, the definition of reflection has been much more open when Moon (1999) asserted that reflection is emanated from various sources, and it could be interpreted in many different ways. Specifically, based on Dewey’s perspective on reflection, Rodgers (2002) identified four criteria for reflection:

a. It is a meaning-making process guiding a practitioner from an experience into the next one with deeper understanding of its relationships and connections with other ideas and experiences.

b. It is a carefully organized, thorough, exact, and disciplined way of thinking, which lies at the root of scientific inquiry.

c. It is required to occur in community and in interaction with other people.

d. It needs attitudes which value personal and intellectual growth of an individual and of others.

Recently, Lee (2005) advocates that the meaning of reflection in educational research has shifted “from “careful consideration, a thought or an opinion resulting from such consideration” to any form of thinking.”.

In general, the early definitions looked at reflection as a considerably high level of thinking process which involves careful thoughts to particular subjects. However, moving closer to the present time, any form of thoughts is also seen as reflective thinking and the procedure of reflection includes some systematic analysis or interpretation under consideration related to these subjects. It means that reflection needs to be more detailed, concrete, rigorous, and comprehensive when it emphasizes practitioners' description of their experiences and future changes or improvements.

1.2 Categories of reflections

Due to the variety of different sources, the categories of reflection are multi-faceted and diverse, they are not only reflective thinking, but also non-reflective action, habitual action, and so on (Lee, 2005). Simultaneously, Lee added that in the process of reflective thinking, the stages cover not only the progress towards the solution to the problem, but also the writer's level of awareness of the situation. In other words, the process of reflection and the progress in how reflective thinking develops of the writer from beginning to end must be viewed together.

1.3 Reflections and professional development

In education, teachers' professional development is seen as a major career-long process because it combines the experiences from the past and the expectations about the future so that teachers' perception of the present situation is influenced. This kind of perception orientates teachers towards their daily decisions and behavior (Kelchtermans & Vandenberghe, 1994). The practice of professional development encourages changes in teachers' practice; thus, they are able to consider and adapt to those changes to make improvements in their job situation. The knowledge, opinions, values, and new experiences learned from the situation help them build the professional self through the implementation of professional activities in teaching. That is the reason why when Cochran & Lytle (1999) differentiate three different conceptions of teachers' professional development and one of them is called the knowledge-in-practice approach, in which teachers figure out "what work" by the reflection on daily practice.

The tight connection between professional development and reflection has been advocated by many researchers. Van Manen (1991 cited in Galvez-Martin, Bowman, & Morrison, 1998) gives the definition of reflection as "the process by which teachers engage in aspects of critical thinking such as careful deliberation and analysis, making choices, and reaching decisions about a course of action related to teaching." It could be seen that critical thinking and reflecting are the key concepts in this definition when teachers make choices, make decisions about what action to take when they try to overcome the problems while teaching in the classroom. The engagement of teachers in critical thinking and reflection significantly helps in developing themselves and consequently, they become more professional over time.

1.4 Methods of analyzing reflective data

Since reflection is multi-dimensional, for example, it is established based on many different individuals' thoughts and feelings, or it has various contexts and definitions; different researchers have set up different criteria and methods of analyzing reflective data. In order to gain some valuable insights into how researchers analyzed reflective data, I have looked at four frameworks and make the comparison between them in table 1.

Table 1. The comparison of the four frameworks

	Research Title	Authors (Year)	Focus of the framework
1	Reflection in teacher education: towards definition and implementation	Hatton & Smith (1995)	The improvement in reflective ability over time was not examined. <ul style="list-style-type: none"> • The categories of critical reflection set were too high so that the students' writing was not sophisticated enough for Hatton and Smith's critical reflection category.
2	Construction and application of an evaluative tool to assess reflection in teacher-training courses	Fund, Court, & Kramarski (2002)	<ul style="list-style-type: none"> • Content and form (Analyzing reflective data and showing improvements in different categories of reflections)
3	Understanding and assessing preservice teachers' reflective thinking	Lee (2005)	<ul style="list-style-type: none"> • Content and depth (Analyzing reflective data and showing improvements in different categories of reflections)
4	Levels of reflection in action research. An overview and an assessment tool	El-Dib (2007)	<ul style="list-style-type: none"> • Steps in action research and level of reflection (Identifying action research steps and analyzing categories of reflection in each step of action research)

Table 1 shows that frameworks suggested by Fund, Court, & Kramarski (2002), Lee (2005) and El-Dib (2007) analyze the content of the reflective data as well as investigating reflective categories of the subjects. However, Hatton and Smith's framework only look at the reflective levels. Consequently, I will investigate the frameworks by Fund, Court, & Kramarski (2002), Lee (2005) and El-Dib (2007) to choose the one that is the most appropriate for my research purpose in the next section.

2. Frameworks for analyzing reflective data

2.1 Framework 1: Content and form framework (Fund et al., 2002)

With the stress on the ability to reflect as teachers' important competency throughout their professional lives, Fund, Court, and Kramarski (2002) conducted a research study during a basic compulsory teacher-training course which deals with didactic and key issues of teaching and learning. 65 science students in their final year of a first-degree program were asked to submit their weekly reflections concerning the previous lesson. The study described the framework which was applied to analyze preservice students' reflective thinking after teaching a class by looking at the two dimensions of their reflections, the object (content) and the form of writing. In their reflections, the students were given plenty of space to state their thoughts, feelings, hesitations, etc. The students' components of their reflections related to the content ("what"), the didactic features ("how"), and to themselves (as the "I" in the lesson. The results showed that the students' reflections shifted from the description to a more deliberative form called "critical bridging".

2.1.1 Dimension 1: Content

This dimension refers to very important issues that the writer identifies. It includes three components of reflective thinking:

- Subject matter-content: Subject matter content is about 'what' is being reflecting about. It refers to the educational issues being reflected upon in the reflection. For example, in the student's reflection, "In my field of computers, however, I think that sometimes the teacher must suppress the creativity because it can be harmful.". The subject matter-content is teachers' creativity when using computer.

- Didactic content: Didactic content is about "how" the subject matter is delivered, including the teaching-learning strategies and methods applied in the lesson. For example, the student reflected that "The lesson was conducted through an inductive method", so "an inductive method" is the didactic content

- Personal content: The students wrote about themselves as the participants in the lesson or as a consequence of it. For example, in the student's reflection, "I got a sad feeling when reading those two items during the lesson.", "I got a sad feeling" is the personal content since the statement starts with "I".

2.1.2 Dimension 2: Form

There are four categories of reflection in the form dimension:

- Description: students gave a description of particular events. For example, "In last week's class we saw a movie on body language in teaching." described an activity in the classroom. This category is considered the lowest category of reflective thinking. However, the need to have it in this framework is undeniable because it helps evaluate any change in the ability to reflection.

- Personal opinion: students express their opinions or feelings about an issue or a problem. For example, "Personally as a student, I always preferred the cultural approach, giving me the methods, the principles to solve the problem, instead of just 'pouring' the material into me.", the student expressed her preference without theoretical background. Although there might be a link to previous experience, this category is still considered a low category of reflective thinking because it emphasizes the writer's standpoint, rather than relying upon the evidence from literature.

- **Linking:** This is considered higher category than the description and personal opinions categories because the writer connects the happened issues/problems with his previous knowledge or the literature. For example, “Lam in his book says the same that school is based on delivering knowledge, instead of developing high level thinking skills.”, the student linked a particular issue to Lam’s (an author) written opinion, but not further elaborating.

- **Critical bridging:** This is the highest level of thinking when a writer bridges a certain issue or problem to his previous knowledge and the literature. He may even go further to discuss possible alternate opinions from the literature and general educational conclusions or solutions. For example, from this reflection, “Concerning the two ‘tools’ we practiced in class, to guide us when dealing with discipline problems, as well as while reading the assigned material, I’ve formulated a general idea how to implement it, as I personally see it. I suggest a “combined model” including both the tools and a few other issues which should be taken into account, in my opinion.”, the student invented new piece of knowledge based on the learned material and references to the literature.

There remains a tight connection between the two dimensions in this framework. The content of the students’ reflections was mainly either about the “what”, the “how”, or the “I”. The shift from descriptive writing to the other three patterns of form dimension indicated that simple description was not enough. The students started making connections and coordinating different ideas. Therefore, the increase in the linking form was visible. Moreover, the researchers saw the development from linking to critical bridging when the students gradually began to interpret and analyze the issues. The upward trend in critical bridging showed the existence of the development in sophistication of students’ critical reflective abilities. This kind of development presented that the students became more reflective over time. This is at the core of the beginning of professional development and the students could adopt, nourish, and improve their reflective abilities for their entire professional lives.

2.2 Framework 2: Content and depth framework (Lee, 2005)

Lee (2005) reviewed the criteria for the assessment of reflective thinking for the purpose of having the insights into how to measure the quality of reflection and how to enhance reflection and cultivate reflective practitioners. The study took place in Korea where preservice teachers enrolled as juniors in a secondary mathematics education program. Their reflective journals were one of the three data sources which were used to investigate how the process of reflection of preservice teachers developed. The reflections of preservice teachers were assessed using two components: content and depth.

2.2.1 Content of reflection: The content is about preservice teachers’ main concerns. For example, for the student’ reflection, “The essential parts of a successful lesson are the teacher’s lesson preparation and the instructional skill used in transmitting the lesson.”, her concerns were the areas of curriculum/content, instructional skills, and lesson preparation issues. This component is similar to the content dimension in the first framework.

2.2.2 Depth of reflective thinking: The depth refers to the evaluation of how the writer develops the thinking process. This component is assessed by using three criteria:

- **Recall:** the writer gives the descriptions of what he/she experienced with the interpretation of the situation based on recalling their experiences. For example, when answering the question about “good teaching” for the first time, Mae-Hee only gave a descriptive explanation, “Good teaching is “easy to understand with brief explanations” + “appropriate time management”.”. This criterion is considered the lowest category of reflection when the writer’s attempt is simply the imitations of what they have observed or were taught. The writer does not look for any alternative explanations.

- **Rationalization:** after identifying a concern or issue, the writer tries to find the relationships between pieces of his/her experiences, explains the situation with rationale, asks the question “why it was?”, and eventually comes up with guiding principles or forms their opinions relevant to those experiences. For example, after having some field experience, Mae-Hee’s definition of “good teaching” was “Good teaching means to transmit content knowledge effectively, attractively, and appropriate to students’ level. Good teaching can be performed with many things. Content in the textbook must be recognized to be appropriate for the class organization/students’ level. Then, select content based on the goal of the lesson.”. This time, she was aware of the complexity of teaching and the consideration of curriculum and materials relating to students’ needs.

- **Reflectivity:** the writer reflects on his/her experiences with the plan to improve or change the situation in the future. For example, in the reflection, Mae-Hee stated, “It is my responsibility to take care of these students’ time. It could be useful or useless depending on how I handle this situation. I can’t stand it [heavy responsibility]. However, I need to be here. I must do my job.”, when she saw the value of teaching but at the same time, she struggled with teaching responsibility. In this criterion, the writer analyzes the experiences from different perspectives and especially is able to become aware of the whole situation.

2.3 Framework 3: The inventory of reflective thinking via action research (IRTAR) (El-Dib, 2007)

El-Dib (2007) used this framework to examine prospective teachers’ reflective thinking in their action research reports during the teaching practicum. The author analyzed three stages of action research, which are:

- **Planning:** the participants state their problems and plan for action.
- **Acting:** the participants describe the steps done to solve their problems.
- **Reviewing:** the participants examine the actions and their consequences, question the outcomes, and forecast future actions.

Sharing the same perspective with the authors of the two previous articles, for each stage of action research, the researcher looked at four different reflective categories, including: low, low-medium, high-medium, and high.

- The category of reflection is considered low when the writer entails technical, habitual, subjective, rigid thoughts, feelings, and/or views.

- The category of reflection is considered higher when the writer begins to realize the subjectivity of knowledge, the relativity of truth, the multiplicity of sources of knowledge, and the importance of context in establishing meaning.

- The category of reflection is considered highest when the writer asks questions about his/her own assumptions and beliefs, the effect of the societal and cultural value over educational practices, and the moral and ethical considerations of these practices. This high category of reflection involves the clear visions and decisions on the intentions to act in the future.

3. The application of the 3 frameworks with my research study

Since I am in the process of conducting a research study to learn about the steps of my own materials design, I have already collected the data which is a reflective journal. At the moment, I am at the stage of finding a tool to evaluate my reflections and I came across these 3 frameworks and I am interested to know which frameworks could yield the most interesting analysis. So, in the next stage, I would apply all the three frameworks with my reflective data.

My research study is a case study with myself as the only one participant. The case study was chosen since I have had an intention to look into my process of materials development as a novice materials designer. During this process, I would learn new knowledge about materials design so that at the end, I could obtain some experience and improve the abilities to design learning materials. The conduct of this research study attempts to answer two unconventional process-oriented investigating research questions with one question concentrates on the steps of my process of developing the materials.

In order to observe all results as well as clarifying which framework yields the most interesting results, all three frameworks used the same set of data to analyze. This set of data was the information about the first step of my process of materials design, which is “identifying learners’ needs”. The reason for choosing it is because in one step of materials design, I would organize some particular activities to figure out what I would like to know. Additionally, while doing these activities, I also expressed my opinions, my feelings, etc. Thus, there remains plenty of information I could analyze using the frameworks.

3.1 Framework 1: Content and form framework (Fund, Court, & Kramarski, 2002)

The units of analysis are sentences or clauses which were corresponding to the criteria of the dimensions.

3.1.1 Dimension 1: Content

- Subject matter-content: Referring to the issues emerged from the process of my materials. For example, the sentence, “I shared with my supervisor three approaches I learned from ELT612 (Principles and Practices in Language Teaching II): product approach, process approach, and genre approach.”, shows the topic I focused on, which was about the approaches to teaching writing.

- Design content: Referring to the strategies and methods that I used in designing learning materials. Not using “didactic”, I chose to use “Designing content’ since my reflective data is all about materials design steps. For example, I was planning to learn about the approach used in the designed materials when I wrote “I have to change and read more! If not, I might not have the best approach to teaching writing included in my materials.”

- Personal content: Referring to my own feelings about concerns or crucial issues that I was dealing with. For example, in my reflection, I said “I was surprised! ... I thought those approaches only needed to be taught when students learned how to write an essay, not an e-mail! I felt that writing an e-mail had no relation to these approaches.”. In this sentence, I expressed my feelings that I was surprised.

3.1.2 Dimension 2: Form

- Description: The description of a particular issue I had when designing the materials. For example, the sentence, “I shared with my supervisor three approaches I learned from ELT612 (Principles and Practices in Language Teaching II): product approach, process approach, and genre approach.”, is only the description of what I shared with my supervisor.

- Personal opinion: My opinions or feelings about an issue including my reservations, hesitation or agreement connected to the subjects in the content dimension, and my previous experience. For example, I mentioned my own thoughts at that time in my reflection, “I was surprised! ... I thought those approaches only needed to be taught when students learned how to write an essay, not an e-mail! I felt that writing an e-mail had no relation to these approaches.”

- Linking: I connect the issues with my previous knowledge or the literature. For example, “Product approach: I personally think this approach is totally not a good one, despite the fact that its main focus is on the structure of language (linguistic features) and students receive inputs/ stimuli from teachers, it is just suitable for teaching basic writing to low level learners.”. Nonetheless, I did not make any further elaboration.

- Critical bridging: I bridge a certain issue to my previous knowledge and the literature. For example, I wrote, “From what the researchers claimed, there is no specific number of points in an item of a rating scale ... I decide to remove the midpoint answer and have a 4-point rating scale because I believe that without this midpoint, people would be willing to take time to give me the reasons for their choices.”, I explained my choice using the previous knowledge and the researchers’ perspectives when I designed the rating form.

Table 2. Data analysis using framework 1

Form Content	Description (an event)	Personal opinion (the event and “I as a student”)	Linking (the event, “I as a student”, and previous knowledge)	Critical bridging (the event, “I as a student”, previous knowledge, and the link to literature)
Subject matter- content (What)	I shared with my supervisor three approaches I learned from ELT612...		I personally think this approach is totally not a good one, despite the fact that its main focus is on the structure of language...	From what the researchers claimed ... I decide to remove the midpoint answer...
Designing content (How)		I have to change and read more! If not, I might not have the best approach to teaching writing included in my materials		
Personal content (Feelings)		I was surprised! ... I felt that writing an e-mail had no relation to these approaches		

The results generated from this framework are the combination of various criteria, including:

- The clear sight and the description of the relevant topic/subject.
- My impression of that topic/subject and the current problem.
- To what extent I link the topic to my previous knowledge or to the literature.
- The actions planned to solve the problem.
- The progress on the development of my perspectives and opinions after taking these actions.

At the beginning, I was surprised when I learned that I needed to learn the approaches to teaching writing first. Although I mentioned the approaches I had learned, I just listed their names without showing any links to my previous knowledge nor to the literature. This information tells that I did not read enough literature in order to really understand the already learned approaches as well as the new ones. Based on it, I was able to plan for my future actions and eventually came up with my own perspectives after taking the actions. Generally, this framework significantly helps me take a deep look at my concerns, my thinking process, the connection with my background knowledge, my plans, and what I have learned. Hence, I could see my self-development progress towards the process of materials design, which is very complicated.

3.2 Framework 2: Content and depth framework (Lee, 2005)

3.2.1 Component 1: Content

Similar to the first dimension of framework 1, this component also concerns the issues/problems in my process of materials design. For example, I wrote in my reflection that “I shared with my supervisor three approaches I learned from ELT612 (Principles and Practices in Language Teaching II): product approach, process approach, and genre approach.”. In this sentence, my concern is about the approaches to teaching writing.

3.2.2 Component 2: Depth

- Recall: I give the descriptions with the interpretation of the situation based on recalling my own experiences. This is considered the lowest category of reflection because I simply attempt imitate what I have observed but not looking for any alternative explanations. For example, in the sentence, “Long time ago, a friend asked me to tutor her in English of e-mail writing ... whom she had never met before.”, I only recalled my conversation with a friend.

- Rationalization: I try to find the relationships between pieces of my experiences, explain the situation with rationale, asks the question “why it was?”, and eventually come up with guiding principles or forms my opinions relevant to those experiences. For example, I said “I was surprised! ... I thought those approaches only needed to be taught when students learned how to write an essay, not an e-mail! I felt that writing an e-mail had no relation to these approaches. This might be because when I studied at school, all of the writing lessons were about performing an essay! My previous teachers did not mention anything about writing an e-mail.”. In this sentence, I described what I experienced and also gave my own reason to answer the questions “why”.

Reflectivity: I reflect on my experiences with the plan to improve or change the situation in the future and analyze the experiences from different perspectives. Thus, I become aware of the whole situation. For example, after sharing with my supervisor three approaches to teaching writing I had learned and listening to her feedback, I wrote “I shared with my supervisor three approaches I learned from ELT612 (Principles and Practices in Language Teaching II): product approach, process approach, and genre approach. She stated that

those approaches were not enough, there were more! Actually, I thought that three were all!”. It shows that I looked back and reflected on my experiences and came up with the conclusion that there were more approaches than I thought.

Table 3. Data analysis using framework 2

Depth of reflection	Recall	Rationalization	Reflectivity
Example 1	Long time ago, a friend asked me to tutor her in English of e-mail writing ... whom she had never met before		
Example 2		I was surprised! ... I thought those approaches only needed to be taught when students learned how to write an essay, not an e-mail! I felt that writing an e-mail had no relation to these approaches. This might be because when I studied at school, all of the writing lessons were about performing an essay! My previous teachers did not mention any thing about writing an e-mail.	
Example 3			I shared with my supervisor three approaches I learned from ELT612 (Principles and Practices in Language Teaching II): product approach, process approach, and genre approach. She stated that those approaches were not enough, there were more! Actually, I thought that three were all!

In comparison with content and form, this framework also takes my concern as the center of the assessment of reflection. However, in analyzing the depth, it does not focus on my feelings, my future plans, or the links to my previous knowledge and literature; instead, it concentrates on the reasons for my opinions/perspectives. Besides, it looks at how I reflected on the new experiences. With the examples in Table 2, I gave the reason why I was surprised about the role of the approaches to teaching writing in designing the materials. Simultaneously, I expressed the rationale on the unsuitability of product approach and my reflection on the first time finding the information about the approaches. These pieces of information help me clearly identify all causes of my thoughts, but they do not lead me to the actions taken in the future. In general, this framework does not show much information which supports me in clearly seeing my self-development progress.

3.3 Framework 3: Steps in materials design framework

My first step of the process of materials design involves the activities taken when I attempted to identify learners' needs. These activities with their examples are shown in Table 3 below.

Table 4. The activities taken to identify learners' needs

Identifying learners' needs	Examples
Reading and understanding the approaches to teaching writing	I was planning to teach students how to write ... I have to link the theories related to "the core activity" of the learning materials, here is writing.
Acquiring the knowledge of the principles of Second Language Acquisition (SLA) and English Language Teaching (ELT) in materials development	Besides the approaches to teaching writing, my supervisor told me to read about the roles of SLA and ELT in materials development.
Gaining the knowledge about the principles of course design and articulating my beliefs before designing the materials	After getting the information from many scholars, I could see the fact that all of them have the same perspectives on the principles of course design. The problem is one would have some similar principles with another scholar while this person also points out some principles that the others do not have.
Learning the framework of materials development	I needed to read about the frameworks of materials development.
Recalling a conversation with my friends	Long time ago, a friend asked me to tutor her in English of e-mail writing ... whom she had never met before.
Recalling the conversation with a professor at my faculty	Once I talked to a professor at my faculty, he mentioned that he usually received the e-mails from strangers who asked him to share the information. The problem is there are many e-mails which make the receivers feel uncomfortable...

Conducting the survey and collecting the real e-mails received from strangers of some recipients	I needed to design a rating form which would be sent to the recipients for the purpose of getting their opinions about the e-mails from strangers they have received.
Doing research on the textbooks and websites	I also read some textbooks and websites teaching writing e-mails to strangers.

It is clear that this framework apparently presents every single activity in each step of my process of materials design. It is simply, however, within the limits of the presentation of the steps, not going further to the detailed examination of my feelings, my future plans, my previous knowledge or links to the literature, nor to the reasons for my opinions and the reflections on my experiences. Therefore, the application of this framework to some extent would hinder me from seeing my self-development progress.

4. My framework for the analysis of my reflective data

4.1 Comparison of the three frameworks

It could be seen that although these three frameworks aimed to identify and analyze the participants' development of reflection and their categories of reflective thinking process, each of them has its own way of determining the categories of reflection which directly leads to the appropriate framework that I could use to analyze my reflective data. Table 5 compares the three frameworks together with their strengths and weaknesses.

Table 5. The comparison of the three frameworks

		Strength	Weakness
Framework 1 Content and form	I could identify the connection between my concerns with my opinion, my background knowledge, what I have learned, and my future plans.	It covers many aspects of my process of materials design which help me determine the categories of reflection more easily.	Since it covers many aspects, the identification of reflection might take more time than expected.
Framework 2 Content and depth	The same as framework 1, it centers around my concerns and their connection to my past experience, my opinions and reasons, and how I reflect on my experiences in order to improve the situation in the future.	It looks at my problems of designing materials with different categories of reflection.	<ul style="list-style-type: none"> ● It does not show much information linking to my feelings and helping me see my own self-development progress. ● Not focusing on my feelings, my future plans, or the links to my previous knowledge and literature.

<p>Framework 3 Steps in materials design framework</p>	<p>It identifies the steps towards materials design.</p>	<p>It presents all activities taken clearly so that I could easily compare my steps in designing materials with those proposed by the scholars.</p>	<ul style="list-style-type: none"> ● Not going further to the detailed examination of my feelings, my future plans, my previous knowledge, etc. ● The author reviewed many sources of literature related to the categories of reflection levels, however, what the author came up with (low, low-medium, high-medium, and high) was not explained in detail.
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4.2 My chosen frameworks

From the sample analyses of the three frameworks and the comparison between them, the combination of Framework 3 (action research) and the reflective categories of Framework 1 (form) seems to work best on the analysis of my reflection. Framework 2 was not appropriate because it did not link my concerns with my personal content so that they could not help me see my own self-development progress. Generally, Framework 3 helps me easily identify the steps towards materials design while with framework 1, for each issue, I could clearly see the categories of my reflective data which show the causes of the problems I have been dealing with so that I could go back to the literature in order to learn more and plan for my future actions to overcome these problems. Moreover, since I could understand my feelings, I am able to see the development of my thinking process in order to define whether the connection with my background knowledge exists or not. Eventually, it becomes less difficult to identify my self-development progress of materials design. One of the problems occurred is that this combination may not give the answers to my research questions, hence, I might need to adjust my research questions with the aim of fitting them with the reflective data so that my reflection would be more interesting.

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