The process of Mid-Career Teachers' Class Reflections with One-to-One Devices

Ken USAMI
Meisei University, Japan
usamiken1214@gmail.com

Takayuki KONNO
Meisei University Japan
konno@t-konno.net

Few studies on mid-career teachers have examined teachers' professional development in relation to social change. To address this gap in the literature, this study seeks to clarify the reflection process of mid-career teachers conducting classes using one-to-one devices. The authors applied the ALACT model as a framework to analyze the reflections of mid-career teachers to clarify their conflicts, and processes of awareness. The study used interviews and classroom observation for data collection. As a result of the analysis, the authors identified four reflection processes. The first, mid-career teachers described their weak understanding of the student's readiness while using one-to-one devices for learner-centered learning. The second, they returned to beliefs and sense of mission to raise essential questions. The third, they realized the value of learning of direct interaction with others. The fourth, they realized they had a biased view that teachers should not teach.

Keywords: ALACT model, Mid-career Teacher, One-to-one Devices, Reflection on Media in Education, Teacher Education,

Introduction

In its 2003 DeSeCo project, the OECD identified certain Key Competencies as the abilities required for the knowledge-based society of the future, leading to educational reforms worldwide. In Japan, academic ability has been redefined, with a shift in emphasis toward qualities and abilities. Underlying this redefinition is a change to a constructivist view of learning, which requires teachers to shift their paradigms. Constructivist learning is often discussed together with the development of ICT environments. The use of ICT in the classroom is essential for the development of the Key Competencies (Kubota, 2000). As one aspect of educational reforms to foster qualities and abilities, some have called for developing an environment of one-to-one devices and their use in the classroom (MECSST, 2020).

However, the 2018 PISA survey reported, among other issues, that the time spent using ICT devices in Japanese school classes of National language, mathematics, and science was the lowest among OECD member countries: 3% in national language, 2.6% in mathematics, and 6.2% in science of Japanese students reported using digital devices for at least an hour a week in the classroom. In contrast, the OECD averages were 12.3% in National language, 9.6% for mathematics, and 11.7% for science (National Institute for Educational Policy Research, 2019). In the 2018 TALIS survey, the statistics on the status of efforts to improve teaching in Japan were reportedly low, especially for junior high school teachers: The percentage of teachers who responded "often" or "always" to the question "cite problems in daily life or work to show that new knowledge is useful" is 53.9% in Japan, compared to the OECD average of 76.7%. The percentage of junior high school teachers who answered "often" or "always" to the question of "presenting a problem for which there is no obvious solution" was 16.1% in Japan, compared to the OECD average of 37.5%. These figures indicate that stepping up efforts to improve teaching in junior high schools remains a challenge (National Institute for Educational Policy Research, 2019). As a result, a government policy was issued to develop an environment for one-to-one devices in 2019. The response to the subsequent COVID-19 pandemic led to rapid progress in introducing one-to-one devices by 2020. Nowadays, one-to-one devices are widely used. However, this does not mean that such devices are being used to develop the Key Competencies. If teachers do not adapt to a constructivist view of teaching, the one-to-one devices will not be used effectively. Therefore, teacher professional development is essential.

Such devices are even more significant for mid-career teachers because they tend to experience stagnation in professional development, known as the "mid-career teachers' crisis." Research suggests that their viewpoints tend to become fixed, and they become stuck in a professional rut (Takaira,1995). Therefore, it is a challenge for a mid-career teacher to change that view of teaching, such as by adopting a constructivist view.

However, the professional development of mid-career teachers is undervalued compared to that of early-career teachers (Booth et al., 2021). Booth et al. (2021) noted that a secondary analysis of the TALIS survey showed that mid-career teachers were more likely than early-career teachers to be unaware of the need for professional development: Only mid-career teachers had less than one hour of continuing professional development in the past week, while early career teachers and experienced teachers had more than one hour. This is because the needs of mid-career teachers are so diverse that it takes effort to tailor professional development to their needs (Booth et al., 2021). Booth et al. (2021) suggested that a supportive, flexible, and non-directive environment that helps mid-career teachers identify learning opportunities is critical to their professional development. This type of environment will offer teachers autonomy and agency in professional development. Goodwin and Slotnik (2018) emphasized the importance of developing the expertise of mid-career teachers through reflection and peer coaching. Reflection is even more critical for them because they are generally expected to improve their individual practice more than new teachers are (Sakamoto, 2007).

In other words, they are widely perceived to engage in individual development. Nevertheless, further research is needed on mid-career teachers' reflections to provide the necessary knowledge for understanding their professional development. The research is particularly significant to help mid-career teachers cope with the changing times in the ICT environment, such as the proliferation of one-to-one devices.

Studies on mid-career teachers' reflections suggest that mid-career teachers' views on teaching have been transformed by the significant change in the ICT environment. The subject teacher had one way to teach: teacher-led teaching. However, using one-to-one devices opened up additional choices, such as student self-study and student collaborative learning (Kusamoto, 2022). We can infer from this that introducing one-to-one devices prompted that teacher's reflections and s/he may have reflected on experimenting with one-to-one devices for classes. However, it is unlikely that simply introducing one terminal per student will lead teachers to a constructivist view of teaching. Kubota & Konno (2018) point out that while ICT-based teaching is increasing, it has fallen into a "superficial imitation of educational technology.

Therefore the trigger and the reflection aspect should be clarified to consider the professional development of mid-career teachers. Mid-career teachers may have been conflicted about something and gained awareness of something in reflection. Based on the above, we can define the following two research questions.

> What kind of conflicts do teachers have in their class reflections with one-to-one devices?

> What kind of awareness do teachers gain when they experience such conflicts?

Herein lies the objective of this study. This study seeks to clarify the process of reflection of teachers who conduct classes using one-to-one devices. This study is relevant to the broader literature of research on the professional development of mid-career teachers. It is particularly significant in that it provides necessary suggestions for educating teachers to enable constructivist education using one-to-one devices.

Method

Subject

The subjects of this research project are two mid-career teachers: Teacher X has 12 years of experience at public City A municipal B JHS, and Teacher Y has 14 years at City A municipal C JHS. They are both social studies teachers. This research defined mid-career teachers as those with between 5 and 15 years of teaching experience, using a definition by Kihara (2000). In reviewing previous studies, Booth (2021) found no consensus on the definition of a mid-career teacher, with regard to time in teaching, role and broader life circumstances, and self-definition. In this study, Kihara's definition used in the context of lesson studies was adopted to consider the professional development of mid-career teachers on teaching skills rather than life course studies or school management research.
City A was selected for this research because it is a government-designated city in Japan and provides training programs for mid-career teachers. Two mid-career teachers were selected because they took part in a one-year graduate teacher education training program conducted by City A. They were aware of the policies of the OECD and the MECSST in Japan and were using ICT for learner-centered learning.

Data Collection

The researcher conducted participant observation of the teachers' class. Using a fixed-pointed camera, the researcher

recorded what the researcher learned in the situation and the behavior of the teacher and students. The class Teacher X observed was the Oceania unit in geography for first-graders. The students researched and exchanged their opinions on discrimination against indigenous people. The class of Teacher Y was the North America unit in geography for first-graders. The students researched different aspects of the United States, such as agriculture, industry, culture, and military force, and shared information.

After participant observation, the researcher conducted two interactive reflection sessions with each teacher. All sessions were conducted in March 2023, with each session lasting about 60 minutes, and were recorded. The researcher served as the questioner in the sessions. The topic of the first session was observed classes. The second class concerned the action undertaken in the two years since the introduction of one-to-one devices. At the beginning of each session, the researcher asked about events that had made the subject uncomfortable in the observed class or during the previous two years. Then, the researcher asked more detailed questions about the event, using "Eight Questions" (Table 1) to facilitate reflection.

The "Eight Questions" are based on "nine areas relevant when concretizing in Phase 2" under the ALACT model (Korthagen, 2001), which is considered an illustration of the reflection procedure (Sakata et al., 2019). Though the "Eight Questions" were developed for trainee teachers, it was clear that they were effective even for mid-career teachers (Sekihara et al., 2021).

Data Analysis

The authors applied the ALACT model as a framework for analyzing the reflection of mid-career teachers to clarify their actions, reflections, conflicts, and process of awareness.

Table 1

"Eight Questions" in the ALACT model (Korthagen, 2001)

0. What was the context?	
1. What did you want?	5. What did the pupils want?
2. What did you do?	6. What did the pupils do?
3. What were you thinking?	7. What were the pupils thinking?
4. How did you feel?	8. How did you pupils feel?

Text data were created from the speech data and analyzed as follows, with reference to Sato (2008). The model was segmented and open-coded as follows.

> The subject: The children are not convinced, and the lessons need to be deeper.
> Questioner: What part of you feels that way?
> The subject: They were taking good notes and listening; it was not time for the students' feelings to be moved, such as by saying, "Oh yeah! So now I understand why Aboriginal hands-on activities are so important." (Segment No.68, Teacher X, first session)
> < CODE: Discomfort that the class is not deep enough to discover significance >

Figure 1
The ALACT model describes a structured process of reflection (Korthagen, 2001)
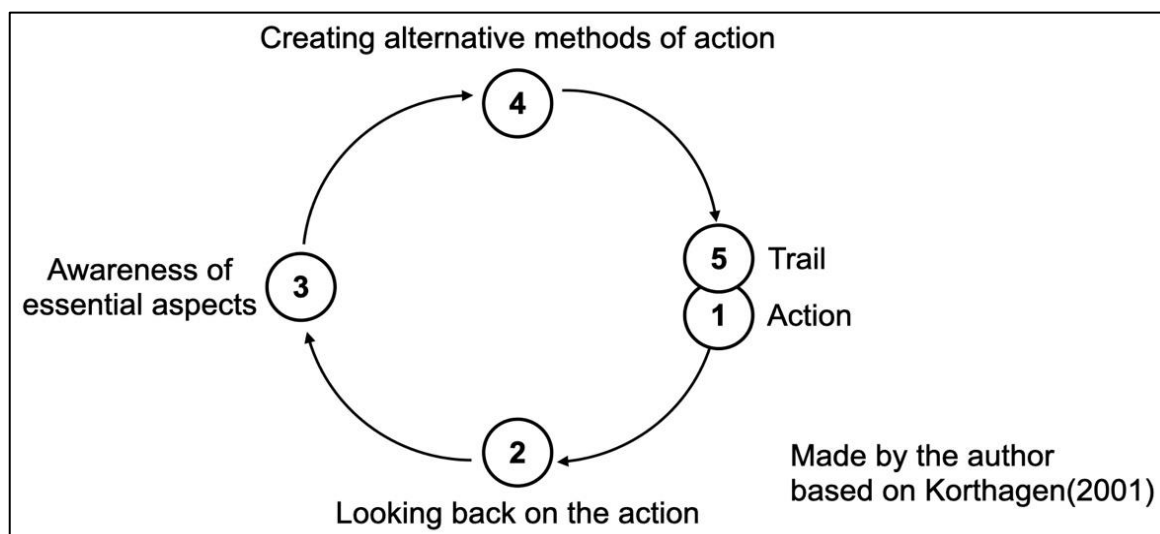
The ALACT model applies the theoretical framework of experiential learning to teacher learning and shows the process by which teachers learn from experience (Korthagen 2001).As shown in Figure 1, the process is organized into five phases: (1) Action, (2) Looking Back on the Action, (3) Awareness of Essential Aspects, (4) Creating Alternative Methods of Action, and (5) Trial. Korthagen (2001) points out that traditional reflection has tended to "Creating Alternative Methods of Action," and argues for the importance of "awareness of essential aspects," which involves reconsidering one's own latent values and implicit judgments supported by past experience and other factors.This study seeks to identify the conflicts and awareness that arose in the class using the one-to-one devices. Conflict arises in phase (2) " Looking Back on the Action ". This is because the subject reflects on their actions, thoughts, and feelings from the standpoint of both teacher and student. Then, awareness arises through the conflict in phase (3) "Awareness of Essential Aspects". Therefore, in this study, we focus on the phase up to "(3) Awareness of Essential Aspects" in the ALACT model.

To clarify which phase the subject's reflection has reached, consider which phase the code fits into. The codes were hierarchized with the ALACT model as a framework, using three levels ranging from "action" to "Awareness of Essential Aspects." The code regarding the subject's self-assessed level of discomfort was placed in the first phase. The second phase was for utterances that were conflicting or thoughtful from the standpoint of the subject and the student, using the "Eight questions." The statements about the subject's ineptitude and the student's inner life that they achieved during the conflict were placed in the third phase.

Then, similar codes in the same hierarchy were grouped to generate concepts. The concepts were grouped, and categories were generated, focusing on the concepts in the "Awareness of Essential Aspects" level as the most critical aspect of the model (Korthagen, 2001). The name of the category matches the name of the concept of "Awareness of Essential Aspects." Figure 2 illustrates the relationship between categories. Nine concepts were generated and four categories were generated. The categories themselves denote the process of reflection. The concepts and categories are shown in Table 2. The categories are indicated by { }, concepts by [ ], codes by < >, and narrative by " ". The speech data are quoted with the wording adjusted to the extent that the meaning of the text is not impaired.

Table 2
Categories and concepts

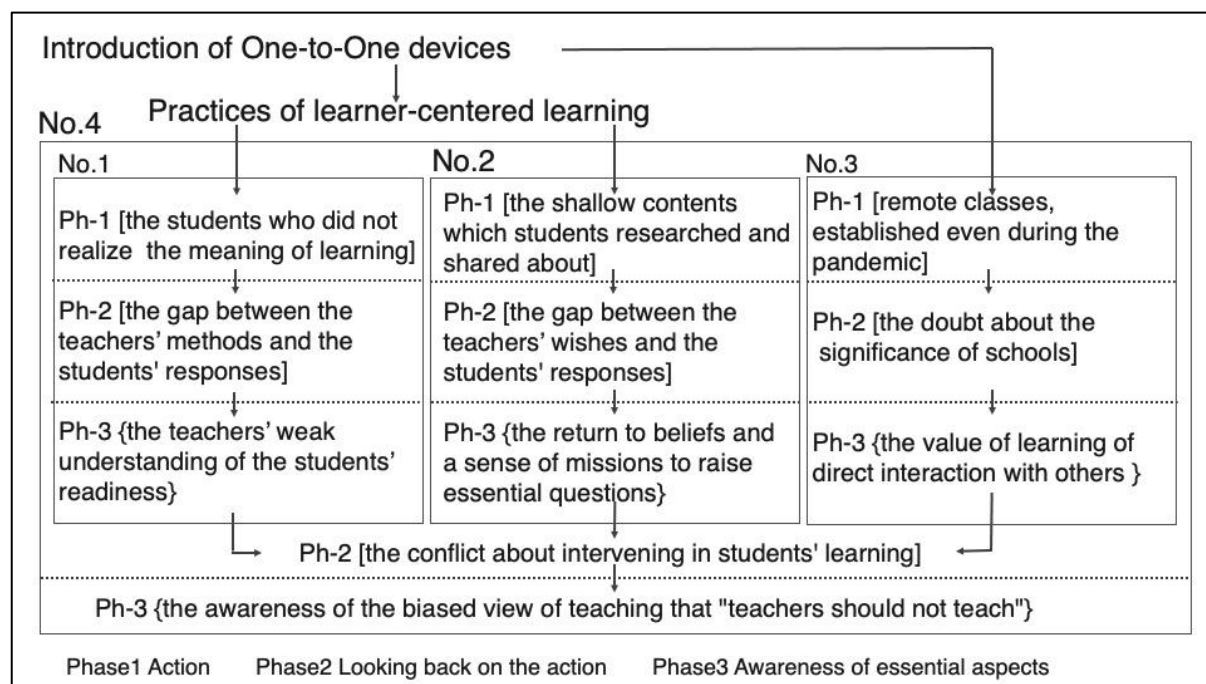| {category}	[concept] & <some representative code>
{the teacher's weak grasp of the student's readiness}	[the students who did not realize the meaning of learning], [the gap between the teacher's methods and the students' responses], [the teacher's weak grasp of the student's readiness], <the actual situation that only few students could learn on their own>, <the methods to keep students engaged>, <difficulty in monitoring students' learning progress>

{the return to beliefs and a sense of mission to raise essential questions}	[the shallow contents which students researched and shared about], [the gap between the teacher's wishes and the students' responses], [the return to beliefs and a sense of mission to raise essential questions], <the experience as a social studies teacher in getting students to think about essential questions>, <the students who believe that just collecting information is learning>, <the assignment that make it difficult for students to find meaning in their learning>
{the value of learning of direct interaction with others}	[remote classes, established even during the pandemic], [the doubt about the significance of schools], [the value of learning of direct interaction with others], <the expectations for students to communicate and learn from each other>, <the methods to facilitate communication among students>
{the awareness of the biased view of teaching that "teachers should not teach"}	[the struggle to intervene in students' learning], [the difficulty in waiting for students to learn at their own pace], [the awareness of the biased view of teaching that "teachers should not teach"], <the experience in avoiding instructions and focusing on letting students make choices>, <the emphasis on inquiry-based learning processes>

Findings and Discussions

The analysis revealed four reflection processes, which are shown in Figure 2. Based on the generated categories, the four processes of reflection are broadly described. The first process begins with the introduction of one-to-one devices and the beginning of practices for learner-centered learning. The teacher felt discomfort with [the students who did not realize the meaning of learning.] Then, the teacher was conflicted about [the gap between the teachers' methods and the students' responses.] Through the conflict, the teacher realizes [the teachers' weak understanding of the students' readiness.] The second process begins with the same opportunity as the first. The teacher felt discomfort with [the shallow contents which students researched and shared about.] Then, the teacher was conflicted about [the gap between the teachers' wishes and the students' responses.] Through the conflict, the teacher realizes [beliefs and a sense of mission to raise essential questions] and returns to them.

The third process begins with the introduction of one-to-one devices in response to the COVID-19 pandemic. The teacher felt discomfort with [remote classes, established even during the pandemic] and was conflicted about [the doubt about the significance of schools.] Through the conflict, they realize [the value of learning of direct interaction with others.] The fourth process begins with these three awareness. From them, A new [conflict about intervening in students' learning] arose within the teacher. Through the conflict, they gain the awareness of [the biased view of teaching that "teachers should not teach."] All of these processes arose toward the goal of achieving learner-centered learning with one-to-one devices.

Figure 2
The processes of reflection of mid-career teachers who are conducting classes using one-to-one devices

The biased understanding of learner-centered learning

Two teachers have been using the one-to-one devices for learner-centered learning for the past two years. In practice, they felt at times discomfort with [the students who did not realize the meaning of learning] and [the shallow content that students researched and shared about]. In phase 2, they focused on the gap between the teachers and the students through the "Eight Questions." Then, they described [the teachers' weak understanding of the student's readiness] and [the return to beliefs and sense of mission to raise essential questions.] Underlying the discussion of both feelings of discomfort is the teachers' strong sense of "learner-centered learning." They thought that teachers should not intervene frequently based on that principle. The teachers took a critical look at their teacher-led teaching practices, such as frequent directions, lengthy explanations, and detailed questions and answers, and had to throw out some of their past practices.

> Over the past few years, I have minimized the amount of time I spend talking and teaching. My speaking time is about 15 minutes per class. I have about seven minutes at the beginning of each class and about seven minutes of sharing at the end. (Segment No.75, Teacher X, first session)

> During the first year of teaching with the device, I sometimes thought the students were learning without me talking. If I prepare the class and coordinate the day of the class, students can learn without me having to teach very much. I believe that if the unit assignment is solid, if the tools for research and thinking are prepared, and if the students engage in activities that allow them to interpret information among themselves, the class will be successful. I thought it would be good for students to learn on their own using the one-to-one devices so that they could positively ask, "Am I meant to be here?" (Segment No.14, Teacher X, second session)

They believed solid intervention on the spot should be avoided even if students appeared unable to learn. During the two years of the COVID-19 pandemic, they recognized [the value of learning direct interaction with others] in school and felt the need to facilitate communication. However, they were occasionally hesitant to do even that because they saw it as an "intervention."

> The subject: I would watch the students without speaking to them in the situation they were investigating. Therefore, if a student were just silently transcribing a textbook, I would leave him alone and wait until he finished.

> Questioner: What did you think would happen if you spoke up there?
> The subject: I thought it would disrupt the atmosphere. The students were immersed, and I did not want to disturb them. (Segment No.232, Teacher Y, first session)

The teachers focused on designing lessons based on the readiness of the students so that they did not have to intervene. They also avoided asking essential questions of their students. However, as social studies teachers, they always emphasized the importance of asking essential questions for authentic learning as follows.

> By studying the Australian unit with the critical concept of discrimination against indigenous people, I wanted to get students to think about the problems that can arise when people with different values live in the same country. I wanted to see what would happen if I asked first-graders to think about that topic. What they learned in this unit will lead them to think about human nature, which will last for the duration of their school and community life. (Segment No.48, Teacher Y, first session)

> Questioner: Why did you add military power as a theme in your geography class?
> The subject: It has to do with the Ukraine issue. We talk about Russia and Ukraine in class. ...Ideally, I want my students to be able to think about international peace when they grow up. To that end, the perspective from world military power is inevitable, and I think the U.S. unit is significant as a subject for learning about it. (Segment No.103, Teacher Y, first session)

The teachers believed that "students should learn general laws and concepts for viewing society in social studies classes," and "teachers should deal with sensitive contemporary issues that are not in textbooks." Despite their belief that it was necessary to intervene more actively to embody their beliefs and sense of mission, they refrained from intervening. Therefore, they were conflicted about whether to intervene in ([the conflict about intervening in students' learning]). The teachers stated, "I interfered with the student's independent learning by intervening" and expressed hesitation, such as "if I intervened too much, they might not improve their skills." Through such [the conflict about intervening in students' learning,] they recognized the difference between a class in which students were left on their own and one in which they received appropriate support. Moreover, they gained [awareness of the biased view of teaching that "teachers should not teach"] and reaffirmed the role of teachers as follows.

> Students can use devices to gather information but are not good at using them to construct their ideas. I have been thinking about ways to solve this problem for a long time. After all, I would have to ask further questions, such as "Why is the country taking this approach?" to make them aware of the value and significance of information. (Segment No. 35, Teacher X, second session)

> The teacher intentionally asks, "Did we not learn something similar to this before?" Students will become aware of social principles by continually asking, "Have we learned something similar to this before?" If such questions accumulate, I believe that students will form concepts about people and society. I thought that without the teachers' intentional questioning, students would not be aware of them. (Segment No.72, Teacher X, first session)

The subject teachers have experience in learning new theories, such as learner-centered graduate school courses in teacher education. It can be inferred that they were conflicted due to their biased understanding of learner-centered learning because they took it to an extreme interpretation. It is not only these subject teachers who tend to lean on new theories when they learn them, indicating that a teacher's professional development is never a linear process but rather a back-and-forth process of adjusting biases.

Mid-career teachers' belief and sense of mission

As expressed in the reflection, the subject's beliefs and sense of mission are the focus of Korthagen's "Core reflection" model. Korthagen noted that the reflection on the experience of failure, like the ALACT model, was not enough for the trainees to "Create an Alternative Method of Action," and proposed "Core reflection" instead (Sakata et al., 2019), which is grounded in positive psychology (Korthagen & Vasalos, 2005). Korthagen and Vasalos (2005) noted that "a central issue in positive psychology is how these strengths mediate between external events and the quality of experience, something that is directly relevant to teacher education" (p.56). Moreover, they emphasized the role that Core reflection could play in leading to profound changes without delving into a person's private life. Core reflection differs from the ALACT model, focusing on successful experiences and one's inner strengths such as behavior, competencies, beliefs, identity, and a sense of mission.

Reliance entirely on the "Eight questions" leads teachers to turn to people's "flaws and abnormalities," as criticized

by positive psychology (Sakata et al., 2019). However, this research captured the tendency to focus on "beliefs" and "a sense of mission" in the absence of "Core reflection." Teachers' beliefs, such as "students should learn general laws and concepts for viewing society in social studies classes" and "teachers should deal with sensitive contemporary issues that are not in textbooks," were mainly related to social studies education. In addition, they talked about their beliefs and a sense of mission statements regarding education in general as follows.

> I do not want students to perceive that the answer is on the teachers' side. The teacher does not have the answer because it lies in their research and thinking. I think of this not only in the classroom but throughout my school life. (Segment No.172, Teacher Y, second session)

> If we had one terminal per student, we could create a state where students could proceed with their learning, but I realized more was needed. Considering the value and significance of learning together in the classroom, teachers need to have discussions with their students at the end of the day. (Segment No.20, Teacher X, second session)

These narratives were well represented in the transition from the second to the third reflection phase. Even in the ALACT model of reflection, the focus was never exclusively on the "flaws and abnormalities." Korthagen and Vasalos (2005) saw a problem with the ALACT model, in that the reflection perspective focused on negative aspects. Why was the ALACT model for mid-career teachers positive, unlike its problem?

There are two possible reasons. The first is that the reflection model developed by Korthagen was initially developed for trainee teachers. When educational interns return from their training and discuss their discomfort, the content will naturally be more likely to prompt them to look at their own "flaws and abnormalities." However, in this case, the reflection was conducted by a mid-career teacher, so it is thought that this aspect of the reflection differed from that of the trainee teacher. The second reason is that mid-career teachers had strong beliefs and a strong sense of mission. Their beliefs and sense of mission may have developed before they became teachers, but their teaching experience reinforced these beliefs. Therefore, even in the sessions using the ALACT model, which tended to focus on teachers' own "flaws and abnormalities," the final phase may have recalled belief and a sense of mission.

From the above, it can be concluded that the guidepost of this back-and-forth process is the teachers' beliefs and sense of mission. This axis makes it possible to correct biased ideas about "learner-centered learning" in this research as one develops one's expertise. However, what if the old view of teaching is held firmly as a belief or a sense of mission? That gives rise to the fear that it may inhibit the incorporation of new theories and practices. The two subjects of this research fall into the former category, having studied in graduate school as long-term trainees. However, many teachers do not have such an opportunity, so they may fall into the latter category.

Conclusion

This study seeks to clarify the process of reflection of teachers who conduct classes using one-to-one devices. The subjects of this research are two mid-career teachers who have taken one-year graduate school courses in teacher education and are using ICT for learner-centered learning. The authors applied the ALACT model as a framework for analyzing the reflections of mid-career teachers to clarify their actions, reflections, conflicts, and processes of awareness. The research used interviews and classroom observation for data collection.

As a result of the analysis, the authors identified four reflection processes: while using one-to-one devices for learner-centered learning, mid-career teachers described [their weak understanding of the students' readiness], [the return to beliefs and a sense of mission to raise essential questions], and [the value of learning of direct interaction with others.] They were conflicted about whether to intervene in the students' learning and gained [awareness of the biased view of teaching that "teachers should not teach"].

The use of one-to-one devices for learner-centered learning is reasonable from the perspective of a constructivist view of instruction. However, teachers learning new theories may occasionally be inclined to take it to an extreme interpretation. Teachers' professional development is never a linear process but rather a back-and-forth process of adjusting biases. The guidepost of this back-and-forth process can be said to be the teachers' beliefs and sense of mission. It was pointed out that a Core reflection model, rather than the ALACT model, was needed for positive reflection focusing on beliefs and a sense of mission. However, mid-career teachers could turn to their beliefs and sense of mission without using Core reflection. Mid-career teachers have a strong sense of belief and sense of mission because their teaching experiences reinforce them. Both have played a role in correcting biases. This study revealed that mid-career teachers' beliefs and sense of mission have a significant impact even as they continue professional

development. Results suggest that beliefs and a sense of mission may support the continued professional development of mid-career teachers.

Finally, we discuss the challenges of this research. The findings of this research do not apply to all mid-career teachers. The subject teachers had experience with long-term outplacement training, but many teachers do not have such opportunities. If one holds firmly to the old view of teaching as a belief or a sense of mission, it is also possible that mid-career teachers may attempt to adhere to the old view of teaching, unlike the case in this study. The reflections of such teachers have not been clarified. In the future, it will be necessary to expand the target group of mid-career teachers and compare their reflections with those of the present study's subjects.

Acknowledgment

Note

This paper is an expanded and revised version of the following papers.
> Usami, K. & Konno, T. (2023). Aspects of Mid-career Teacher's Reflection in Class with One-to-One Devices: A Case Study of Two Japanese Public Junior High School Teachers. ICoME 2023 the 21st International Conference for Media in Education Proceedings. 471-474

References

Booth, J. et al. (2021). Mid-career teachers: a mixed methods scoping study of professional development, career progression and retention. Education Sciences. 11, 299. https://doi.org/10.3390/educsci11060299

Day, C.; Stobart, G.; Sammons, P.; Kington, A. (2006). Variations in the work and lives of teachers: Relative and relational effectiveness. Teachers and Teaching. 12, 169–192. https://doi.org/10.1080/13450600500467381

Goodwin, B. & Slotnik, William W. (2018). Improving Teacher Practice: Debunking the Myth of the Performance Plateau. McREL International. Retrieved September 15, 2023, from https://files.eric.ed.gov/fulltext/ED587394.pdf

MECSST. (2020). [Realizing the GIGA School Concept] giga sukuuru kousou no jitsugen e . Retrieved September 15, 2023, from https://www.mext.go.jp/content/20200625-mxt_syoto01-000003278_1.pdf

National Institute for Educational Policy Research. (2019). [International Comparison of Teacher Environments] kyouin kankyo no kokusai hikaku TALIS: Teaching and Learning International Survey 2018, gyousei, Tokyo

National Institute for Educational Policy Research. (2019). [PISA 2018 Survey Supplement: Students' Use of ICT at School and Outside of School] PISA 2018 nen tyousa hosoku siryou seito no gakkou gakkougai ni okeru ICT riyou, pp.4-6, Retrieved September 15, 2023, from https://www.nier.go.jp/kokusai/pisa/pdf/2018/06_supple.pdf

Kihara, T. (2000). Teacher development based on classroom and action research, Nihonbunkyoshuppan, Osaka

Korthagen, F. et al. (2001). Linking Practice and Theory: The Pedagogy of Realistic Teacher Education, London: Routledge

Korthagen, F. & Vasalos, A. (2005). Levels in reflection: core reflection as a means to enhance professional growth. Teachers and Teaching: Theory and Practice. 11, 47-71. https://doi.org/10.1080/1354060042000337093

Kubota, K. (2000) [Constructivist Paradigm and Learning Environment Design] kouseisyugi paradaimu to gakusyuukannkyou dezain, Kansai daigaku syuppan bu, Osaka

Kubota, K. & Konno, T. (2018). [Environment and ICT for Proactive, Interactive, and Authentic Learning: Cultivation of Qualities and Abilities by Active learning] syutaiteki taiwateki de hukai manabi no kannkyou to ICT: active learning ni yoru shishitsu nouryoku no ikusei, Toshindo Publishing Co.,LTD, Tokyo

Kusamoto, A. et al (2022). The change in teachers' view of teaching and teaching style in one-to-one computing environment. Research Report of JSET Conferences. 4, 30–37. https://doi.org/10.15077/jsetstudy.2022.4_30

Sato, I. (2008). [Qualitative Data Analysis Methods: Principles, Methods, and Practice] shitsuteki deta bunnsekihou: genri, houhou, jissen, Sinyousya, Tokyo

Sekihara, K. & Okazaki, H. (2021). Improving teaching practices through "eight questions" recommended by Korthagen. Memoirs of the Faculty of Human Development University of Toyama. 15, 143–157. https://doi.org/10.15099/00020725

Takaira, K. (1995). Teacher's Mid-Career Crisis: A Life-History Approach. Bulletin of the Faculty of Education, University of Tokyo, pp. 34, 323–331. https://doi.org/10.15083/00029701

Usami, K. & Konno, T. (2023). Aspects of Mid-career Teacher's Reflection in Class with One-to-One Devices: A Case Study of Two Japanese Public Junior High School Teachers. ICoME 2023 the 21st International Conference for Media in Education Proceedings. 471-474