How to promote preservice teachers' reflections through critical incident training

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Introduction: This study with a pre-post design reports the results of training developed from the framework of reflective practice and the critical incident technique (CIT) for teacher education.

Methods: Fifty-three preservice teachers participated in either online or face-to-face training, with the aim of determining if the training sufficiently improved their reflection abilities. To this purpose, an online questionnaire with validated scales on educational satisfaction, reflection abilities, and learning logs were used. The data were analyzed using descriptive statistical analysis and t-tests, as well as qualitative data analysis.

Results: The results show that the students significantly improved their teaching reflection abilities after participating in the training.

Discussion: Giving preservice teachers the opportunity to reflect on their own experiences is thus an appropriate way to foster their reflection abilities.

KEYWORDS

critical incident technique, reflection, teacher education, training, learning logs

1. Introduction

Reflection has a "transformative potential" (Gorski and Dalton, 2020, p. 357) that allows individuals to change their understandings and beliefs. Reflection is a key competence for teachers to improve their professional skills or promote their self-development (Van Beveren et al., 2018). Noormohammadi (2014, p. 1380) defines teachers' reflection as "the process of examining beliefs, goals, and practices to improve student learning."

Reflection is a broad concept that can be defined with a focus on two different components. First, reflection can be regarded as an action and a process. Schön (1983, p. 29) describes reflection as a "tacit process of thinking," with theories on informal learning at the workplace telling that reflection forms actions conducted by individuals or teams to find solutions (e.g., to work problems; Decuyper et al., 2010). Second, reflection can be distinguished by its objectives, meaning the content of the reflection, the setting where it occurs (Messmann and Mulder, 2015), and the depth of reflection (Schippers et al., 2007) can vary.

Research shows that reflection can improve classroom interaction (Solheim et al., 2018) and positively affect teacher self-efficacy and autonomy (Noormohammadi, 2014). Therefore, courses, programs, and training that focus on teachers' reflection competencies are an accepted part of teacher education programs (Beauchamp, 2015). Different methods have been used in these programs, including video-based trainings (Gröschner et al., 2018), case studies (Arseven, 2018), and hybrid learning settings (Mumford and Dikilitaş, 2020). However, research also demonstrates lacking systematic evaluation of the effects of these interventions. Furthermore, studies indicate that preservice teachers' reflections often concern competence or structural (environmental) aspects, and they often get stuck at the descriptive stage of reflection (Körkkö et al., 2016; Arslan, 2019).

The Critical Incident Technique (CIT; Flanagan, 1954) was first introduced for research purposes and to improve professional development (Leicher and Mulder, 2018). Its aim is to

collect "any observable human activity that is sufficiently complete in itself to permit inferences and predictions to be made about the person performing the act" (Flanagan, 1954, p.327). The CIT provides learners with the opportunity to find an important and relevant experience that acts as the starting point for a learning process. Studies indicate that the CIT can be "used as a reflective tool" to foster teachers' reflection (Yu, 2018). Furthermore, research results indicate that reflecting on one's own experience can foster professional development (Griffin, 2003). It can help individuals to understand their own experience as a source for learning (Markkanen et al., 2020).

A training program for teachers in German nursing education was designed to improve their reflection skills using the CIT. Therefore, in this study, a training using the critical incident technique was used to give preservice teachers the opportunity to increase their reflection abilities by reflecting on their own experiences. Preservice teacher students in their second or third semester of a master's degree study program on nursing education at a German university took part in the training. To determine if the training allowed the students to improve their reflection abilities, a study with pre- and post-test design using an online questionnaire and learning logs was conducted. The aim was to grant every student the opportunity to find their own experiences and start a reflection process. In order to find out how preservice teachers' reflection process could be described, learning logs were used. The training was designed to take place online or face-to-face using a content platform and meetings hosted online or at the students' university.

Clarà (2015, p. 3) informs that reflection processes are accomplished to give "coherence to a situation, which is initially incoherent and unclear," and are thus related to events and experience. For our study, reflection is defined as the cognitive processes of thinking in and re-thinking of situations to gain new insights. Based on the model of reflective practice for teacher education (Jay and Johnson, 2002), the dimensions of descriptive, comparative, and critical reflection can be differentiated. To determine if the training helps students improve their reflection abilities, a study with a pre- and post-test design using an online questionnaire and learning logs was designed. Learning logs offer a possibility to get insights in preservice teacher students' reflection process by finding out on what dimension different reflection activities of their reflection process take place. The goal of this study was to discover if the CIT-based training can help foster preservice teachers' reflection abilities.

The research questions were as follows:

- Is there a difference between preservice teachers' general and teaching specific reflection abilities after the training compared to their abilities beforehand?
- Do preservice teachers describe the different dimensions of reflection (descriptive, comparative, critical) during training in their learning logs?

2. Framework

2.1. Reflection and reflective practice

Two theoretical perspectives on reflection act as important points of departure for this study. First, Dewey (1933) argues in favor of giving individuals the opportunity "to acquire habits of reflection so

they can engage in intelligent thought and action rather than routine thought and action" (Farrell, 2012, p. 9). Second, Schön (1983) builds on Dewey's ideas and presents experiences as a source of knowledge and learning. As Fendler (2003, p. 19) states, "the meaning of professional reflection is riddled with tensions between Schön's notion of practitioner-based intuition, on the one hand, and Dewey's notion of rational and scientific thinking, on the other."

For Dewey, thinking and reflection are interconnected. Dewey (1933, p. 9) defines reflection as "active, persistent and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it and the further conclusions to which it tends." In his view, the outcome of reflection is important, but the process of reflection is the most crucial part. Dewey further defines reflection as a "meaning-making process" that helps individuals get a deeper understanding of their experiences (Rogers, 2008, p. 845). Using Dewey's concept of reflection as a basis, Schön (1995) delves into how professionals think and gain knowledge through their practice and develops his own conception of reflection and reflective thought in two forms: reflection-on-action and reflection-in-action. Reflection-in-action can be described as the "the tacit processes of thinking which accompany doing" (Leitch and Day, 2000, p. 180). Schön (1995, p. 30) also defines reflection-in-action as a "spontaneous performance" that is "triggered by surprise," with the trigger leading individuals to think about the situation, their behavior, and the strategies and actions that they have chosen in the situation. This then allows individuals to "restructure [their] understanding of the situation" (Schön, 1995, p. 30) and makes them aware of their own assumptions and mental models. In contrast, reflection-on-action is the "thoughtful consideration and retrospective analysis of the individuals´ performance in order to gain knowledge from experience" (Leitch and Day, 2000, p. 180). According to Schön (1983), being able to perform both forms of reflection equals how a reflective practitioner carries out reflection.

Hatton and Smith (1995, p. 34) summarize the most important achievements from both Dewey's and Schön's works in considering reflection a "reflective action," linking reflection to timespans, acknowledging reflection as an opportunity to solve problems, and differentiating hierarchies of reflection. To understand reflection as an activity opens possibilities to foster it in teacher education programs by providing preservice teachers the ability to accomplish reflection in the first place. This idea is connected to Schön's assumptions that characterize reflection as activities in or on action. Schön's reflection-in-and on-action imply that reflection can take place while actions are accomplished or in looking back on experiences or situations. Reflection on experiences or situations in the past could offer preservice teachers the ability to develop action strategies to handle comparable situations in the future in another way (Hatton and Smith, 1995). This is related to the assumption that reflection is aimed at problem-solving. This is important when reflection concerns real problems and experiences. Schippers et al. (2007) differentiate between shallow, moderate, and deep reflection as reflection modes that concern different content, such as situations, values, and norms. Shallow reflection is described as the beginning of the reflection process that included getting aware of the situation or experience that could be reflected. Moderate reflection "is characterized as a more critical approach toward tasks, goals, strategies, and processes" (Schippers et al., 2007, p. 191). Deep reflection questions values, attitudes, and cultural norms (Schippers et al., 2007). Svojanovsky (2017) describes that giving students the possibility to gain

experience and reflect on it, is a central condition for the success of teacher education programs. Therefore, to design preservice teacher trainings that foster reflection, it is important to give participants opportunities to refer to their own experience and to different dimensions of reflection.

2.2. Teacher reflection

According to Dewey, reflective thinking should be an important aim for education and therefore for the "learning and teaching of everyone involved in education, including students, pre-service teachers, and experienced teachers" (Schmidt and Allsup, 2019; p. 4. Dewey (1933) also notes that teachers who do not reflect become "slaves to routine" (Farrell, 2012, p. 9). For Dewey, reflective teaching implies that teachers define aims for their teaching and are aware of the consequences. Reflective teaching involves different stages of reflection in which "teachers monitor, evaluate and revise their own practice continuously" (Pollard and Collins, 2005, p. 14). For this purpose, competence is necessary, as achievable through continuing professional development (Pollard and Collins, 2005). Schön (1983) outlines how professionals are able to reflect and gain new knowledge from this process. There are different sequences that are important to teachers' reflection-in-action. Notably, reflection can be triggered by a situation or a problem, wherein teachers' routine responses "do not produce a routine response and instead a surprise for the teacher" (Farrell, 2012, p. 10). This unexpected situation can lead to teachers engaging in reflection during the action. Being able to reflect in the situation can help teachers experiment with new action strategies. Getting involved in these sequences also allows teachers to receive new meanings.

Jay and Johnson (2002) describe their model of "reflective practice for teacher education" as a means of obtaining a better understanding of the processes related to reflection. They highlight three different dimensions of reflection: descriptive, comparative, and critical. The descriptive dimension includes questions regarding the situation or experience that the reflection concerns; the "matter of reflection" (Jay and Johnson, 2002) is made clear, and consequently, circumstances, feelings, and consequences of the event are reflected upon. In the comparative dimension, perspectives from others and research and literature findings are integrated; people ask themselves how others would think about their events, how they can improve, and if there are other ways to think and act in the specific situation. Lastly, the critical dimension includes thinking about the implications of the reflection process and consequently obtaining a new and revised perspective on the situation. Therefore, it is necessary to think about deeper knowledge regarding the situation and to question general structures and circumstances.

3. Method

3.1. Training using the critical incident technique

Our training was based on Jay and Johnson's (2002) dimensions of reflection, wherein each dimension (descriptive, comparative, and critical) had a corresponding lesson. The descriptive dimension focuses on reflection to determine the problem and become aware of what the content of reflection could be. Therefore, the CIT was utilized. Participants were asked in the training's introduction to describe a problem or challenge they experienced in their internship or practical work as a teacher at a vocational college for nursing. Further questions asked about the number of people involved in that situation, consequences of the situation, and assumed causes of the situation. For the second (comparative) dimension, students got the opportunity to talk in small groups about their critical incidents, as in this dimension, students should be aware of other perspectives and views on their critical incident. Students received key questions as triggers for their discussions and also tasked them with conducting a literature review and searching for relevant research studies to solve their problems. In the final lesson on the critical dimension, the students were tasked with creating a five-minute presentation and formulating a statement that represented the solution to their critical incident. Figure 1 shows the full training structure.

A training method to promote preservice teacher students' reflection abilities by using the CIT was developed. Based on Dewey's model on experiential learning, learning can be understood as a process in which experiences are integrated in existing knowledge structures (Kolb, 2003). Dewey (1933) describes experiences as trigger for further learning process such as reflection. Study results show that reflection on one's own experience is essential for developing a reflection teaching practice (Mathew et al., 2017) and can successfully be fostered in teacher education programs by guiding students in their reflection process (Poom-Valickis and Mathews, 2013) The CIT uses instruction to trigger participants to describe a concrete experience of a specific topic. Further questions regarding situational circumstances help participants better detail situations or problems (Mulder, 2015). By describing a concrete experience and working on a solution, participants are able to acquire knowledge and skills that can be directly transferred to their work.

FIGURE 1
Structure of the training.
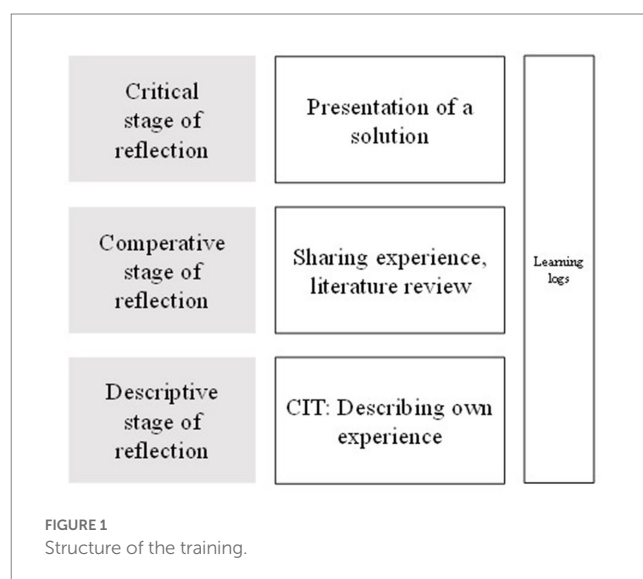
3.2. Design

This study had a pre- and post-test design featuring an online questionnaire and learning logs. By analyzing the quantitative data collected through validated and self-developed scales gives the possibilty to determine if self-reported reflection abilities changed over time as the preservice teacher participated in the training. These measurements concern the outcome of the training by focusing on the development of reflection abilities. Teacher education programs should not only be evaluated by focusing on their output as the development of skills (Ward and McCotter, 2004). Attention should also be paid to the process of reflection, that is "more narrative, than analytical or systematic" (Marcos et al., 2009; p. 202). Based on Schön's (1983) definition, reflection can be defined as a process in which different contents can be reflected on different dimensions. To find out, what dimensions are involved in preservice teachers' reflection, learning logs were used. The learning logs were used to collect qualitative data both during and beyond the meetings, though the logs' use was optional. Using learning logs gives the possibility to capture the narratives of the reflection process. Furthermore, the participants were free to decide what content they wanted to include in their logs. The goal of the qualitative data analysis was to find out on which content preservice teacher are reflecting on and to reveal if different dimensions of reflection are available in the participants' descriptions.

3.3. Sample

The participants in our study were preservice teachers in their second or third semester of a German nursing education master's degree program. This study was conducted at a German university in the federal state of Baden-Württemberg. In Germany, various study programs in the field of nursing education exist. In the involved study program, students receive a master's degree and are then able to work as nursing teachers in vocational colleges. Fostering reflection abilities is a goal of many teacher education programs in Germany.

In the involved study program, the students had the option to take part in our training. They were informed of the voluntary and pseudonymous data collection method. The data were anonymized after the end of the data collection period. Participants' sociodemographic information was not collected because of the small group size, as we wanted to guarantee full anonymity. We only controlled for satisfaction with the training. Ethical approval was obtained from the ethics committee of the University of Education Schwäbisch Gmünd.

The trainings were conducted in the summer and winter term at the involved German university. Two trainings each were conducted online and face-to-face. The first data collection started with a pre-test in April 2021 and ended with a post-test in August 2021, while the second data collection started with a pre-test in October 2021 and ended with a post-test in February 2022. Data collection in the face-to-face trainings started in April 2022 and October 2022 and ended with post-tests in August 2022 and January 2023. Data of the face-to-face trainings were collected with paper- pencil while all other data were collected using an online questionnaire. The first data collection included 12 preservice teachers, and the second featured 21 preservice teachers. In the first face-to-face training, 13 preservice teacher participated, and in the second, 7 were involved. Overall, we analyzed data from 53 preservice teachers ($N = 53$).

3.4. Instruments

The same online questionnaire for the pre- and post-tests that included validated and self-developed scales was used. To start, Andersen et al.'s (2014) 5-point Likert-type Groningen Reflection Ability Scale was used (1 = $never$, 5 = $always$) to measure reflection abilities (e.g., "I am aware of the possible emotional impact of information on others"). As the Groningen Reflection Ability Scale measures a more general ability to reflect, a new scale was developed that focuses more on specifically teachers' reflection abilities called the Teacher Reflection Scale. This scale is based on the teaching reflection inventory (Akbari et al., 2010) and a scale from Schippers et al. (2007) that measures reflection in groups. The Teacher Reflection Scale has two subscales that measure teachers' reflection activities regarding their professional teaching (e.g., "When I am successful, I take time and think about how I succeeded") and their teaching and instruction (e.g., "I think about introducing new teaching methods in my lessons"). The Teacher Reflection Scale made measurements using a 5-point Likert scale ranging from 1 ($never$) to 5 ($always$).

To measure educational satisfaction, the a 5-point Likert scale instrument from Kenny et al. (2016, 1 = $absolutely not$, 5 = $absolutely$; e.g., "I am satisfied with the amount of training provided") was used. Educational satisfaction was used as a control variable (Bernerth and Aguinis, 2016) because based on self-regulated learning theory, it can be assumed that low educational satisfaction leads to lower engagement in the training.

Learning logs were also utilized for the participants to record their reflection processes during the training. Learning logs have previously been described as a form of "reflective assessment" (Friesner and Hart, 2005, p. 117). Using learning logs in this study had several advantages. First, the logs gave the participants the opportunity to reflect on their experience independent of the training meetings. Second, they allowed the participants to describe their reflection process in their own words. Third, the learning logs were provided to the students through their online learning system. The participants were free to choose how often they made entries in their log, what content they relayed, and what kind of entries they made (e.g., pictures, narratives, statements, etc.). Instructions and key questions were provided to inspire preservice teacher to write about their experiences. In the introduction of the learning logs, participants were informed about the anonymous data collection through the learning logs and asked them to write down whatever they thought about their critical incident, things related to their critical incident, and solution strategies. They also were informed that there were no right or wrong answers and that they were free to design their learning logs however they liked. Questions to trigger and inspire the participants were provided. Examples of questions are: "What did you learn?" "Did you talk with somebody about the experience you are reflecting on?" "What went successfully for you?" "Did you read a helpful paper?"

4. Analysis

In this study, quantitative data via a questionnaire and qualitative data via participant learning logs were collected. Analysis of the quantitative data included descriptive statistics (mean, standard deviation), explorative and confirmatory factor analysis (EFA and CFA, respectively), and analysis of Cronbach's alpha. A t-test with the

Friedman *post hoc* test was conducted to analyze differences between the results in the pre- and post-tests.

Data collected from the learning logs were analyzed qualitatively using a deductive strategy (Mayring, 2019). Based on our theoretical framework of teacher reflection (Jay and Johnson, 2002), the data were categorized into the descriptive, comparative, or critical dimensions of reflection. Based on these categorized answers, subcategories were introduced.

5. Results

5.1. Descriptive statistics and *T*-tests

5.1.1. Descriptive statistics, factor analysis, Cronbach's alpha

Data were analysed by and estimating the mean and standard deviations. The results of our EFA showed suitable factor loadings for the scales. For the Training Reflection Inventory (Akbari et al., 2010), the results of the factor analysis indicated six subscales of reflection: practical, critical, meta-cognitive, learner, cognitive, and practical. EFA also confirmed the two subscales of our self-developed TRS. A CFA was conducted with Mplus as well: the results showed an acceptable fit of the measurement model, with fit indices of 0.98 for Comperative fit index (CFI) 0.001 for Standardized Rout Mean Square Residual (SRMR), and 0.01 for Root Mean Square Error Approximation (RMSEA). Cronbach's alpha for all scales showed acceptable results. Table 1 shows the means, standard deviations, and Cronbach's alpha values for the scales.

5.1.2. *T*-test

A *t*-test was conducted to identify significant differences between the data from the pre- and post-tests. With regard to general reflection abilities, our results showed a pre-test mean of 2.22 with a standard deviation of 0.32. In the post-test, our results indicated a mean of 2.07 with a standard deviation of 0.31. The *t*-test results showed that these differences were significant ($t = 3.676$; $p < 0.001$; Cohen's $d = 0.30$).

Regarding teacher reflection abilities, our results showed a mean of 2.47 with a standard deviation of 0.40 for the pre-test and a mean of 2.03 with a standard deviation of 0.40 for the post-test. The *t*-test showed that these differences were significant as well ($t = 6.245$; $p < 0.001$; Cohen's $d = 0.50$). Concerning educational satisfaction, our results showed no significant differences (pre-test: $M = 2.44$, $SD = 0.44$; post-test: $M = 2.30$, $SD = 0.60$; $t = 1,611$; $p > 0.11$; Table 2).

5.2. Qualitative content analysis

To assess the data collected from the learning logs, qualitative content analysis was used. Fifty-three learning logs with a minimum of 1 and maximum of 11 inputs were analysed. The data were analysed for stages of reflection and reflection as a process.

5.2.1. Stages of reflection

When analyzing data on the stages of reflection, each input in the learning logs was assessed as a separate unit. It was not controlled if the inputs were given before and after meetings. The entries in the learning logs were categorized per the dimensions of reflection; not all

TABLE 1 Descriptive statistics and Cronbach's alpha.

Scale	Mean	SD	Cronbach's Alpha
Groningen reflection ability scale	2.01	0.292	0.75
Teacher reflection scale—professionalism	2.46	0.617	0.83
Teacher reflection scale—instruction	2.48	0.589	0.75
Educational satisfaction	2.45	0.571	0.75

For all pre-test and post-test ratings; $N = 66$; Groningen Reflection Ability Scale: 5-point Likert scale ranging from 1 = "very often" to 5 = "never"; Teacher Reflection Scale: 5-point Likert scale from 1 = "very often" to 5 = "never"; educational satisfaction: 1 = "absolutely satisfied" to 5 = "absolutely not satisfied".

TABLE 2 Results of the *t*-test.

Scale	Mean, SD Pre-test	Mean, SD Post-test	*T*-test
Groningen reflection ability scale 5-point Likert scale ranging from 1 = very often to 5 = never	$M = 2.22$ $SD = 0.32$	$M = 2.07$ $SD = 0.31$	$t = 3.676$; $p < 0.001$; Cohen's $d = 0.30$
Teacher reflection scale 5-point Likert scale from 1 = very often to 5 = never	$M = 2.47$ $SD = 0.39$	$M = 2.03$ $SD = 0.40$	$t = 6.245$; $p < 0.001$; Cohen's $d = 0.50$
Educational satisfaction 1 = absolutely satisfied 5 = absolutely not satisfied	$M = 2.44$ $SD = 0.44$	$M = 2.30$ $SD = 0.60$	$t = 1.611$; $p < 0.11$

learning logs exhibited all dimensions. Table 3 shows the categories and corresponding sample quotes from our analysis.

Our results showed that in the descriptive reflection dimension, participants either detailed a specific situation or a more general problem. The descriptions focused on topics such as heterogeneity, teaching methods, disturbances in the class, classroom management, and time management.

One student described a situation in which a trainee was angry about their exam results. The student's problem was that she was not sure how to cope with this and similar situations:

> *"[…] I gave the trainee the exam. I already thought that she would not be happy about the results. First, I thought she was sad about that, but in the next moment […] she was so angry that she scrunched up the exam and threw it on the floor. […] I was absolutely overwhelmed with the situation."* (P07).

Another student presented a problem in which different groups of trainees had to work simultaneously:

> *"[…] While I was giving feedback to the trainees of one group […] the trainees of the other group did not work and used the material to play around. I did not know how to handle this."* (P38).

In the comparative reflection dimension, participants used literature and research papers to obtain more insights and talked to other students or colleagues. One student said:

TABLE 3 Category system and quotes.

Category (Number of assignments)	Sub-category	Quote
Descriptive dimension of reflection (50)	Specific situation	*"Pupils in my class are unmotivated and slow. They do not engage in the lessons. I tried different methods and techniques such as using pictures, PowerPoints, working together in groups, but nothing worked."* (P14)
	General problem	*"Heterogeneity in vocational education and training."* (P12)
Comparative dimension of reflection (70)	Reading literature and research studies	*"I read a text about cognitive learning, and I talked about that with the other students, and that lead me to think about how I am learning. I ask myself, do pupils learn in the same way, or do they simply not even know how to learn?"* (P09)
	Talking with other students or colleagues	*"I talked about my problem with an experienced college. It was very helpful to get her points of view."* (P47)
Critical dimension of reflection (25)		*"I am so happy that I found the solution in the theory and that it is really working in practice."* (P22)

Original quotes are in German language.

"Our lecture today and having the opportunity to talk with the others was so helpful for me!" (P42).

Another student told how reading a paper on collaboration let them reflect on their own experiences:

"Reading a paper on cognitive learning and collaboration in groups lets me think about what learning strategies I use. I asked myself if only a small percentage of the trainees are learning in the same way I do or if they do not know how to learn." (P41).

The students also indicated that they engaged in many conversations and discussions with others to get new perspectives on their problems. As one student discussed:

"I had a conversation about my problem with a colleague who has [a lot of] experience in teaching. I wanted to get new insights and a new perspective on my experience. I also told her that I am doing a literature review to find a solution to my problem." (P32).

Another students explained:

"Today at work I had the opportunity to talk to my mentor. I was able to describe the whole situation to her. This conversation helped me take the next step toward a solution." (P28).

In the critical reflection dimension, the students mostly developed different solutions to their described problems. One student wrote in their learning log:

"For my problem, I have arrived at a crucial insight into classroom management. Now I know it is part of professional teaching." (P44).

Another student stated:

"I am so happy. Theories can be applied in practice. That is so great!" (P32).

One student told:

"Now I feel confident. I make plans on how to arrange my lessons in the future!" (P19).

5.2.2. Reflection as a process

The learning logs were analysed in their entirety to reveal what the complete reflection process looks like. Our results showed that most teacher students (30 of 53) reported a reflection process starting with the description of a problem (descriptive stage) and ending with finding a solution (critical dimension). Twenty-three students did not inform on all three dimensions of the reflection process. An example of a reflection process describing all dimensions is provided in Table 4.

Table 5 shows an example of a reflection process containing only the descriptive and comparative dimensions.

6. Discussion

This study was conducted to determine whether training using the CIT can foster preservice teachers' reflection abilities. A pre- and post-test design was used and quantitative and qualitative data were collected. Results indicate that preservice teachers who participated in the training differed in their teacher reflection abilities. Furthermore, qualitative analysis of their learning logs showed that the preservice teachers accomplished different dimensions of reflection during their participation in the training.

Our results demonstrate that using the CIT was an appropriate method to trigger preservice teacher students' reflection. They engaged in different activities, such as discussions with colleagues, to gain more insights. Furthermore, our results show that the students' reflections can follow different stages. Using the CIT, all of them were able to describe a relevant situation or experience on which they wanted to reflect. The content of the experiences varied from their own competence to classroom management. In the comparative stage of reflection, the students were able to engage in discussions to find new perspectives on their problems. Most of them reported searching for literature to find possible solutions as well. Not all students accomplished the critical dimension of reflection, however. In their learning logs, some of the students got stuck in the process of finding a solution, which could be attributed to their low motivation to make entries in the logs at the end of the training. Our results are in line with prior studies on teacher students' reflections that show that reflection is more descriptive (Körkkö et al., 2016; Arslan, 2019). A reason for this could be the lack of opportunities to teach experience in

TABLE 4 Example "Planning my lessons" (P26).

Dimension	Quote
Descriptive dimension of reflection	*"As a beginner, it is really difficult for me to choose relevant topics from a bigger complex. So I decided to put as much information a possibly in my slide and tell pupils everything about it. After the second lesson, pupils complained that I was going too fast and they were not able to understand."*
Comparative dimension of reflection	*"I talked to my colleagues. A lot of student teachers do have this problem. Perhaps is necessary to be flexible."*
Critical dimension of reflection	*"Today we had a lesson about constructive alignment. That's it! I have to ask myself what competences do the students need to have and not what do they have to know. I am not an information broker. I am a designer of learning environments."*

TABLE 5 Example "All about rules" (P51).

Dimension	Quote
Descriptive dimension of reflection	*"Some pupils do not abide rules. This is so frustrating for me."*
Comparative dimension of reflection	*"I did a literature search today. In some studies they call it challenging behaviour."*

practice. Instead, the students detailed experiences from, for instance, a successfully resolved practical training, but they were not sure if they would get the opportunity to introduce a solution in the same setting. Our results also show that the students could improve their reflection abilities, which is important to allowing them to reflect on situations in their future professional lives as teachers.

It is an important goal of many teacher study programs to foster students' reflection abilities. Jäger (2013) assumes that teachers who are able to reflect on their teaching and instruction have the competence to make well-founded decisions. Other studies show that the competence to reflect is related to emotional intelligence and pedagogical competence (Susanto et al., 2019). Therefore, various interventions such as learning with virtual reality (Philippe et al., 2020) or trainings for reflective teaching practice (Zahid and Khanam, 2019) have been previously implemented and evaluated. The present training using the CIT differs from these other interventions, as it aims to reflect on preservice teachers' own experiences by providing a framework that can be used in the reflection process. This training design has different advantages in line with the theoretical key assumptions on teacher reflection. Notably, the reflective action is linked to timespans, so preservice teachers can strengthen their ability to reflect by using their own past experiences to reflect on further actions. Reflection is an opportunity to solve problems, meaning students can present a solution to a problem they are reflecting on. Reflection can also happen in different dimensions; in this study, that triggered the students to think about their problems from different perspectives. This does not mean that reflecting on one dimension is better or more helpful than reflecting on another. Rather, different dimensions of reflection help individuals "gain insights from that process with reference [to] (1) additional perspectives, (2) one's own experience, values, and beliefs, and (3) the larger context within which the questions are raised" (Jay and Johnson, 2002, p. 76).

One limitation of our study is the small sample size. Additionally, the training was provided online and face-to-face within the duration of just one term. However, we used different scales to measure the teacher students' reflection, and as a result, the results give insights into students´ general reflection ability and accomplishment of activities for reflection. Still, it is important to consider that the teacher students' abilities were measured and not their cognition or attitude toward reflection.

7. Conclusion

There are practical implications in the design of learning environments that allow teacher students to reflect on concrete experiences. Through these, students are able to develop their reflection skills and obtain more insights into how to handle critical situations in their teaching. In this study, the CIT allowed students to think about their own experiences, and in the corresponding training, they became familiar with a guideline on how their reflection processes can be accomplished. The training fostered teacher students' abilities to reflect and made them familiar with different dimensions of a reflection processes that can help to cope with other situations or experiences they experience in their future career. Reflection can include both professional and personal development; accordingly, it is necessary to give teacher students the opportunity to use their own experiences.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by Ethics committee of the University of Education Schwäbisch Gmünd. The patients/participants provided their written informed consent to participate in this study.

Author contributions

VA developed the study design, collected data, analysed data, and wrote the paper.

Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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