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Improving Student Classroom Teachers' Content Organization Skills Through Practicum

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The process of learning and teaching involves the organization of the interaction among teachers, students, and content. The focus of this study was to enable the student teachers' experience of deliberate practice to improve their organization of specific content and develop practice skills in classroom environments. This study, which adopted a holistic single-case method, examined fourth-year student classroom teachers' content organization skills in a teaching practicum course. The study was conducted with 11 fourth-year student teachers, who were attending a teaching practicum course, and data were collected through an open-ended test, a semi-structured interview form, and lesson plans. The student teachers were provided with four weeks of training on the components of concepts and generalizations, and with information selecting-organizing-integrating (SOI) techniques. The participants were asked to prepare lesson plans and implement them in the classroom environment. Over six weeks, the researchers provided the participants with feedback and corrections for the lesson plans they prepared. The findings showed that the participants could not reflect the SOI techniques and the components of the concept and generalization in the lesson plans they prepared at the desired level. When the findings from this study were evaluated, we can state that organizing the content in lesson plans and the application of it is indeed a challenging process for student teachers. To efficiently carry out the said task, they need effective and well-structured support from teacher educators.

Introduction

The process of learning and teaching involves the organization of the interaction among teachers, students, and content. In this process, students require a teacher's support to realize cognitive actions, such as constructing knowledge and forming schemas (Reigeluth & Moore,

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1999). Providing students with this support requires the planning of learning and teaching processes and the organization of information to be taught.

Teaching practicum courses offer student-teachers an important opportunity to learn by doing in order to acquire content organization skills during their pre-service education (Zeichner, 2010). Therefore, this case study aims to enable fourth-year student classroom teachers to acquire content organization skills through the consideration of the components of concepts and generalizations in lesson plans they prepared in a teaching practicum course.

Content organization skills for teaching

Content organization involves organizing and presenting information in the subject matter in line with the instructional objectives and student characteristics in order to obtain an effective, efficient, and appealing learning outcome (Reigeluth & Moore, 1999). The content organization of a lesson requires decisions about the types of knowledge and how to present them, planning teaching based on these decisions, and preparing the teaching materials. Teachers can organize content using subject matter knowledge (SMK) and pedagogical content knowledge (PCK). SMK is a teacher's amount and organization of knowledge to be taught in a specific discipline (Shulman, 1986). PCK, meanwhile, is knowledge about the learning-teaching principles and strategies that are related to how the information is represented and how it will be presented to students (Shulman, 1986). However, the topic investigated in this study is related to the use of PCK.

Some of the criteria to be taken into consideration in student teachers' education include content organization skills and the organization of activities (Brouwer & Korthagen, 2005). Student teachers can show how they organize the information to be taught in their lesson plans by using their PCK. It is also stated in the literature that the learning and teaching beliefs of teachers and student teachers affect the design of teaching activities (Pajares, 1992).

Their experience in real classroom environments creates an appropriate context for student teachers to acquire content organization skills, and these skills can be understood by analyzing the lesson plans they prepare and discussing these plans with them (Beyer & Davis, 2012). Developing a lesson plan is the final mental preparation a student teacher makes before entering a classroom; it is also the phase that enables them to imagine real scenarios. Student teachers inevitably reflect their learning and teaching beliefs in this preparation process (Richardson, 2003). Then, the moment they indicate which knowledge they will present in the lesson is the moment student teachers are closest to the real environment; therefore, including lesson plans in this study was considered appropriate.

The literature has even been reported that teacher education programmes may be inefficient in improving student teachers' skills while learning to teach (Allen & Wright 2014; Brouwer & Korthagen, 2005; Darling-Hammond, 2000; Kagan, 1992; Kömür, 2010). To fill this gap, student teachers should be exposed to guided experience learning to teach where they can enact their teaching skills successfully (Zeichner, 2010). Hence, there has been an increase in practices aimed at improving student teachers' teaching skills through deliberate practice (Aydin, Demirdogen, Akin, Uzuntiryaki- Kondakci & Tarkin, 2015; Hagger, Burn, Mutton & Brindley, 2008; Hennissen, Beckers & Moerkerke, 2017). In deliberate practice, appropriately designed tasks are presented, and feedback about these tasks is used to help student teachers gradually acquire effective teaching skills (Ericsson, 2006). Effective teaching practices can

assist student teachers in recognizing the impact of their learning and teaching beliefs on regulating teaching activities, as well as facilitating the changing of these beliefs (Tillema, 2000; Van Driel, Beijaard & Verloop, 2001).

However, studies on practicum have mostly focused on student teachers' views and the difficulties they encounter in practice (Aslan & Saglam, 2018; Batmaz & Ergen, 2020; Caires & Almeida, 2005; Gürbütürk & Çalıř, 2019; Kakazu & Kobayashi, 2022; Koc, 2012; Koc & Yıldız, 2012; Mirici & Ölmez-Çağlar, 2017; Nayır & Çinkır, 2014; Ünver & Kurşunlu, 2014). To strengthen the bridge between theory and practice, studies that support student teachers' teaching skills and professional development through practicum (Chen, Tseng, & Wu, 2022; König, Bremerich-Vos, Buchholtz, & Glutsch, 2020; Sevimli-Celik, 2021; Stenberg, Rajala, & Hilppo, 2016) and studies that show the importance of reflection in a teaching practicum, are increasing (Maaranen & Stenberg, 2017). Also, studies examining the role of mentor and supervisor in a teaching practicum draw attention (Agricola, van der Schaaf, Prins, & van Tartwijk, 2020; Liu, & Siteo, 2020; Mok & Staub, 2021). However, studies that have examined content organization in a specific topic are limited (Aydin et al., 2015; Becker, Waldis & Staub, 2019; Emre-Akdoğan & Yazgan-Sağ, 2018; Hanuscin, Cisterna & Lipsitz, 2018; Juhler, 2016; Masters & Park Rogers, 2018). Therefore, there is a need to examine how student teachers acquire the skills to use the specialized knowledge they have to teach specific content through teaching practice in a classroom.

SOI techniques and components of concept and generalization

Mayer's (1999) Select, Organize, and Integrate (SOI) information model includes techniques that can guide the organization of teachers' instructional explanations (messages) based on constructivist learning. Constructivist learning depends on the learner's cognitively active processing of instructional messages in the learning process, such as selecting relevant information, organizing the information into coherent mental representations, and integrating incoming information with prior knowledge (Mayer, 1999). The SOI model also supports constructivist learning, and the model is used to enhance meaningful learning and learners' construction of information through scientific text, textbooks, lesson presentations, and multimedia environments. According to Mayer (1999) "when the goal is to encourage the learner to become cognitively involved in learning, instruction should be designed to help the reader identify useful information, understand how the material fits together, and see how the material relates to prior knowledge" (p.152).

According to Mayer's (1999) model, the selection of information includes techniques that help a 'learner's selection of relevant information to be retained in the working memory' (p.149). These techniques include attention focusing tools (using headings, writing bold/italic, underlining, margin notes, repetition, white space, and so on), using adjunct questions and instructional objectives, removing irrelevant information and presenting a summary (Mayer, 1999).

Organizing information encompasses the techniques that enable a learner to "organizing the selected auditory representations into a coherent verbal representation and organizing the selected images into a coherent pictorial representation" (Mayer, 1999, p.149). These techniques include identification of the comparison and contrast, classification structure, generalization structure, cause and effect structure, enumeration, graphics, pointer words, and identification of the outlines (Mayer, 1999). Integrating information includes techniques that enable "students to make one-to-one connections between corresponding elements of the

pictorial and verbal representations they have constructed using prior knowledge” (Mayer, 1999, p.151). Such techniques include the use of advanced organizers, animation with narration, illustrations, worked-out examples, and elaborative questions (Mayer, 1999).

In this study, the SOI techniques were chosen to organize related information to teach the concepts and generalizations of the primary school curriculum. The SOI model offers evidence-based techniques for designing selected content rather than how to select and sequence the information to be taught (Mayer, 1999). Also, teachers teach content that has already been selected and sequenced in the curriculum. In the teaching practicum course, student teachers teach a subject suggested by their mentor teachers in a limited time. Therefore, in this study, the SOI model was preferred since it was aimed to present the concepts and generalizations to be taught in the textbook compatible with the curriculum by the student teachers and to present them through a teaching material (PowerPoint presentation, worksheets, visuals, and so on).

The fundamental components of concepts and generalizations are the focus of teachers’ instructional explanations (Wittwer & Renkl, 2008). The fundamental components required to teach a concept include *the label and definition of the concept, concept hierarchy, and critical and variable attributes of the concept, examples and non-examples, and demonstrations of the critical attributes of the examples* (Merrill, Tennyson & Posey, 1992; Tennyson & Cocchiarella, 1986). The components required to teach a generalization include *the generalization’s name and proposition, the concepts used in the proposition, interrelationships among the concepts, and examples* (Merrill, 1983). Considering the above, in explaining concepts or generalizations, teachers’ use of techniques that help students select and organize important knowledge and integrate it with their previous knowledge could help them create meaningful mental structures or deeper learning and produce better learning outcomes (Fiorella & Mayer, 2016).

Previous studies have shown that student teachers have difficulties in designing instruction for their lesson plans and need support to effectively create the conceptual structure (Emre-Akdoğan & Yazgan-Sağ, 2018; Juhler, 2016). In a meta-synthesis study by Akbulut-Taş and Karabay (2016), it was reported that student teachers experienced difficulty in organizing and presenting the content in teaching practice in Turkey. Moreover, Ding, Hassler, and Li (2021) found that some experienced teachers had challenges in implementing cognitive instructional principles in their lessons. Then, content organization skills can be improved when necessary support for learning to teach is provided.

Content organization is one of the most important processes of course design. However, in order to organize the content of a course, student teachers should first be able to organize in their own cognitive structures regarding that subject (Fiorella & Mayer, 2016). Such cognitive organization can also influence how they apply SOI techniques. Therefore, we can say that this study is important for pre-service teachers to realize the contribution of SOI techniques to their meaningful learning and to make them aware of the difficulties they may encounter while using these techniques.

The focus of this study was to enable the student teachers’ experience of deliberate practice to improve their organization of specific content and develop practice skills in classroom environments. The teaching practicum course was chosen so that student teachers could practice their teaching skills, such as reviewing instructional objectives according to the class level and topic, organizing content, preparing, or organizing teaching activities and materials, and

selecting and implementing assessment activities. The study only limited student teachers' skills in identifying the components of concepts and generalizations and using the SOI techniques in teaching these components in the lesson plans they prepared. The following research questions were investigated:

- Did student teachers' content organization scores increase significantly after the training?
- To what extent do the student teachers use the information they obtained from the training in the lesson plans they prepared before and after the training?
 - a) What are the SOI techniques used in lesson plans?
 - b) What are the components of concepts and generalizations used in lesson plans?
- How were student teachers' opinions about the feedback and corrections given for the lesson plans?

Methodology

Research approach and context

This study utilized a holistic single-case design (Creswell, 2008), which aimed to conduct an in-depth analysis of student teachers' content organization skills in the Teaching Practicum II course. The case study is "an empirical inquiry that investigates a contemporary phenomenon in-depth within its real-life context" (Yin, 2009, p.18). Thus, this design is appropriate for in-depth investigation of the research problem. This study was carried out with 11 fourth-year student teachers (a bachelor's level degree) who were enrolled in the classroom teaching programme in the Department of Elementary Education, Faculty of Education at a state university located in southern Turkey.

The pre-service teacher education period is eight semesters in this university. In the teaching practice course given in the 7th and 8th semesters, student teachers go to the schools affiliated to the Ministry of National Education once a week (the practicum takes 14 weeks). At the beginning of the term, the practicum schools of the student teachers are outlined in the framework of the "Faculty-School Partnership" protocol. Each group consists of 12 student teachers; these groups are determined by the Dean of Education Faculty and a supervisor is appointed. School administrators identified the mentor teachers for whom the student teachers are responsible. Mentor teachers have the "mentor teacher certificate" given by the Ministry of National Education. Mentor teachers decide on the classes of the student teachers, the lessons, and topics they will teach together with them; they give feedback on their performances. Supervisors provide instructional support, such as examining the draft lesson plans prepared by the student teachers, give feedback and corrections, observe the implementation of the lesson plan (student teachers prepare a lesson plan every week) produce solutions together when they have difficulties, and provide feedback after the implementation. Student teachers participate in all courses, together with the mentor teacher. In this study, the researchers also work as supervisor.

Teaching practice courses are conducted in schools at different socio-economic levels. In this study, the elementary school where the practicum was undertaken is located in a low socio-economic environment, and the classrooms included 30–35 students.



Training context

It was observed that there was no model used to organize the content in the lesson plans in the teaching practice course at the university where this research was conducted. An existing lesson plan prepared by student teachers consists of the lesson description, introduction, learning-teaching experiences, conclusion, and assessment and evaluation. The student teachers were asked to use SOI techniques, the components of the concept and generalization in this structure. The student teachers in this study were given four weeks (3 hours weekly) of training on the ‘Components of Concept, Components of Generalization, and Selecting-Organizing-Integrating Techniques’ (Appendix 1). The content of training was prepared based on the conceptual structures related to the teaching of concepts and generalizations (Merrill, 1983; Merrill et al., 1992; Tennyson & Cocchiarella, 1986), while the SOI techniques was structured based on the SOI model, which is a sub-component of Mayer’s generative multimedia learning theory (Mayer, 1999).

Participants

The participants were 11 student classroom teachers (10 women and 1 man) who were enrolled in the fourth year and were undertaking the “Teaching Practicum II” course. Since a male student teacher did not want to complete the activities, the data obtained from him was not included in the analysis. Since constant communication was required between the participants and the schools, the participants were selected among the students that the researchers were consulting. All participants had previously prepared lesson plans within the undergraduate courses. Because of the “Faculty-School Partnership” protocol, this study was conducted with few participants.

Instruments

Data were collected through an open-ended test, a semi-structured interview form, and the lesson plans.

Open-ended test

The test was prepared by the researchers and considered the content components of concepts and generalizations in order to identify student classroom teachers' skills in lesson planning and content organization. The views of three instructors who specialized in curriculum and held Ph.D. degrees in the field of classroom teaching were used to inform the preparation of the open-ended test. These specialists assessed the five questions according to the criteria of serving the study purpose and being clear and comprehensible. After specialists judged that the questions were appropriate, the test was finalized. The open-ended test functioned as this study’s pre-test and post-test.

Three out of the five questions in the test were:

- A) “Students can explain the difference between erosion and landslides and predict the potential future consequences of erosion”
- B) “Students can explain the effect of the climate on human activities in their environment by giving examples from their daily lives”

The above instructional objectives were derived from the primary school fourth-grade science

and social studies curriculum. Please answer the following questions in consideration of these objectives:

Question 1. If you were to prepare an appropriate lesson plan for the instructional objective in option A, what kind of plan would you prepare? Please explain it.

Question 2. Please explain what information you would need to present in the lesson plan you would prepare to teach the concepts of erosion and landslides detailed in option A?

Question 5. How would you organize the content of the lesson in a lesson plan that will be prepared to help students acquire the objectives given in options A and B, what content organizing techniques would you use to achieve these objectives? Please explain.

Semi-Structured Interview Form

A semi-structured interview form was prepared to identify participants' views of their experiences throughout the process. The interview form was developed with input from an instructor who held a doctorate degree, three instructors from the university's Department of Curriculum and Instruction, and one instructor of classroom teaching. The interview questions were piloted with two fourth-year student classroom teachers who were not participants in the study. In line with the obtained views, the questions were revised, and the form was finalized.

Documents

The documents were the lesson plans prepared by the student classroom teachers to teach the concepts and generalizations of the primary school social studies, science, mathematics, and Turkish curriculum. Participants prepared a single lesson plan for any of the above courses after the pre-test was completed. Following the training, one lesson plan was prepared each week for six weeks; hence, each participant prepared seven lesson plans. Consequently, 77 lesson plans were analysed. The participants prepared their lesson plans to be implemented within the period indicated in the course schedule. Lesson plans were limited to teaching a concept (natural disasters, erosion, landslide, mixtures, adding fractions, measuring time, length measurement units, weather condition, weather event, electrical circuits, public opinion, and others), coordinate concepts (literal and figurative meanings, subjective-objective judgments), or a generalization (factors affecting environmental pollution, rotation and revolution movements of the earth).

Procedure

Data were collected over a period of 14 weeks. Initially, pre-interviews were conducted with the 11 student classroom teachers enrolled in the teaching practicum course, who were given information about the training they would receive and the tasks. Informed consent was obtained for participation in the study. Before the training, the pre-test was administered, and the participants were asked to prepare a lesson plan for the social sciences, science, mathematics, and Turkish courses. The participants were then given four weeks of training outside of lesson hours in the school's seminar hall, with the approval of the school administration. The training was conducted using PowerPoint and mutually asking questions and discussions and worksheets. The participants determined the concepts and generalizations that would be included in these lesson plans together with their mentor teacher. The researchers did not intervene in this process.

The participants were given one-to-one feedback and corrections related to how they reflected



the training content in their lesson plans. Feedback and corrections were offered as suggestions (e.g., you can present by matching examples and non-examples, explain why the example you gave is an example of the concept, present it with a table and diagram, use a worked example, etc.). They decided for themselves whether to reflect on these in their lesson plans. Technical equipment and infrastructure were made available to the student classroom teachers to implement their plans. The student classroom teachers presented videos and PowerPoint presentations of the lesson to the students with projectors. Once the practicum was completed, a post-test was administered.

The pre-test and post-test were both administered by the researchers at the school. Following the post-test, the participants were interviewed using a semi-structured interview form. The interview focused on the student classroom teachers' reflection of the content organization their lesson plans, the quality of the training provided and the practicum process. Both researchers participated in the interviews. All the interviews were audio-recorded after the participants gave consent and transcribed verbatim for analysis. Each interview lasted approximately 40 minutes.

Data analysis

Firstly, the answers given by the participants in the pre-test and post-tests were scored using a rubric prepared by the researchers. In rubric, the student classroom teachers' incorrect explanations were given 1 point, missing or inadequate explanations were given 2 points, acceptable explanations were given 3 points, and accurate explanations were given 4 points. Zero points were given when there was no answer or irrelevant explanations were included. The participants' scores ranged between 0 and 20. Four participants' pre-tests and post-tests were assessed by two researchers independently. The consistency between the two raters was calculated using Cohen's Kappa ($K=.844$), and a positive, significant relationship was detected. All the tests were then scored by the two researchers, and a consensus was reached in the scores given. The scores obtained were analysed by Wilcoxon Signed-Rank Test. The significance level was .05.

In this research, a content analysis method was used to analyze and interpret the lesson plans and interview transcripts. Participants were coded as P1, P2, P3... and quotations from participants' discourses were used while preserving their original expressions. Two coding types were used in this study: Coding - based conceptual framework and coding-based data (Yıldırım & Şimşek, 2016). The codes related to the SOI techniques, the components of the concept and generalization that the participants included in the lesson plans were determined with the conceptual framework. The codes related to the interview transcripts were obtained from the data. Line-by-line open coding was used to analyse each of the qualitative data.

The interviews were transcribed verbatim by the researchers. The interview transcripts (85-pages, 10-point font; 1.5 line spacing) and 77 lesson plans were coded by both the researchers independently. The interview transcripts belonging to two randomly chosen participants were coded. Coding consistency was calculated $[84/(84+9) \times 100]$ (Miles & Huberman, 1994), which was .90. The codes were grouped according to their similarities and differences, and the codes associated with each other were brought together to enable thematic coding. Finally, the codes were interpreted and explained.

Seven lesson plans of a randomly chosen participant were coded by the two researchers, and the consistency was calculated $[109/(109+9) \times 100]$ (Miles & Huberman, 1994), which was .92.

Thereafter, lesson plans were shared and coded by the two researchers. The codes associated with each other were correlated to obtain upper categories. The obtained coefficients show that this study is reliable. Example extracts are presented to reflect the participants' views.

Findings

In this study, the first research question, 'Did student classroom teachers' content organization scores increase significantly after the training given?' was examined (see Table 1).

Table 1. *Wilcoxon Signed-Rank Test Results of the Student Classroom Teachers' Skills of Content Organization Scores before and after the Training*

Posttest-Pretest	N	Rank mean	Rank Total	z	p
Negative Rank	0	.00	.00	2.809*	.005**
Positive Rank	10	5.50	55.00		
Equal	1				

* based on negative ranks
**P<0.05

In this study, in line with the first research question, the post-test scores showed that there was a significant difference between the pre-test and post-test content organization scores of the student classroom teachers ($z= 2.809$, $p < 0.05$). This difference was in favor of positive ranks, namely the post-test score. The student classroom teachers' mean pre-test score was 8.25, meaning the post-test score was 12.63.

Content components and SOI techniques in student classroom teachers' lesson plans before and after training

The frequency distribution of the codes and categories in relation to the components and SOI techniques used by the student classroom teachers in their lesson plans before and after the training are presented in Table 2 and Table 3. These findings are descriptive, rather than comparative.

Table 2. Codes and Categories Obtained from the Student Classroom Teachers' Lesson Plans

Categories	Codes from the lesson plans before training	f	Codes from the lesson plans after training	f
Selecting information techniques used in the plans	Asking questions to attract attention and activate prior knowledge	6	Informing about the instructional objectives	65
	Bold text, titling, coloring	3	Explaining the importance/benefit of the topic in real life	59
	Indicating estimations about students' potential explanations	3	Using attention focusing tools (bold text, underlining, coloring, or, in italics, using margin notes)	59
	Explaining the importance/benefit of the topic in real life	2	Activating prior knowledge (asking questions, giving examples, reminding students of the definition)	55
	Stressed articulation	2	Indicating the instructions in a clear and comprehensible manner	40
	Using video	2	Drawing attention (asking questions, animating, using illustrations/realia)	35
	Giving instructions	1	Indicating topic titles	28
	Using bullet points	1	Using pointers to make information clear (arrows, quotation marks, bullet points)	27
			Providing a summary	15
			Giving a brief summary of the important information	7
		Indicating key concepts	5	



Continued Table 2

Categories	Codes	f	Codes	f	
Organizing information techniques used in the plans	Using illustrations (pictures, photographs)	4	Using pictorial representations (pictures, photographs)	35	
	Using feedback, corrections, clues, and reinforcements	4	Using feedback, corrections, clues, and reinforcements	32	
	Listing (the results of an event)		1	Representing the same information in different ways (the writing with figures, symbols, illustrations, etc.)	24
				Listing (chronological ranks, attributes, consequences of an event)	23
				Using tables and schemas (for comparison and classification)	21
				Asking guiding questions	18
				Concretization (concrete statements, anecdotes)	18
				Using concrete models and realia	10
				Presenting the information supporting the context	5
				Using diagrams (cause-effect, flowcharts)	4
			Indicating the framework of the topic	3	
Integrating knowledge techniques used in the plans	Reviewing the topic (summarizing)	4	Preparing worksheets	57	
	Using worksheets	3	Reviewing the main idea	40	
	Using video as an advance organizational	3	Asking elaborative questions	36	
	Animating the story	2	Asking for self-explanations from the students	18	
	Asking questions (elaborative and deductive)	3	Using videos	17	
	Revising and doing exercises	2	Animating	5	
			Using a semantic analysis table	2	
			Benefitting from simulations	1	
			Instruction through narration	2	



As seen in Table 2, the student classroom teachers' lesson plans before the training mainly included selecting information techniques. These techniques included the basic components that should feature in lesson plans (asking questions, summarizing, giving examples, using worksheets, and so on) and did not demonstrate diversity. It can be stated that they use information organizing and integrating techniques less.

Table 2 also shows that the student classroom teachers' lesson plans after the training frequently included information selection techniques, such as informing students about the objectives, explaining the importance of the topics, activating prior knowledge, using attention-focusing tools, giving clear and comprehensive instructions, drawing attention, using pointers that make information clear, and using titles. The information organization techniques used by the participants included, presenting visuals, listing, using feedback, revision, clues, and reinforcements, representing information in different ways, using tables and schemas, asking guiding questions, making information concrete. The employed information integration techniques were found to include preparing worksheets, summarizing, asking elaborative questions, using videos, doing exercises, asking for self-explanations. Two participants' views supporting this finding are:

In the worksheets, I used worked out examples. I emphasized the important parts by writing with capitals or in bold. I mostly gave examples and tried to help them discover the concept by themselves. Asking them to give the definition was more enjoyable for me. I particularly asked “why” questions, to which I did not receive answers in the first week, but I began to receive very good answers throughout the final weeks. (Participant 10).

I emphasized some parts to gain attention (...). In a lesson plan I prepared about the environment, I benefited from a schema about environmental pollution: I made branches from the middle of the schema, divided them into air pollution, water pollution, and land pollution. (Participant 11).

When Table 3 is examined, it can be stated that the student classroom teachers mostly focused on the components of the concept (e.g., examples of the concept) in the lesson plans before the training, and they did not include the components of generalization. Whereas Table 3 shows that the student classroom teachers' lesson plans after the training frequently included the explaining, definition, attributes, and examples of a concept, giving the label and definition of the concept, asking students to explain by giving examples, giving divergent examples and additional examples, and explaining non-examples of a concept, asking students to give examples and non-examples and using worked-out examples.

Table 3. Codes and Categories Obtained from the Content Components Used in the Student Classroom Teachers' Lesson Plans

Categories	Codes from the lesson plans before training	f	Codes from the lesson plans after training	f
Content components used in the plans	Using examples of the concept	4	Explaining examples of the concept	40
	Giving the label and definition of the concept	2	Giving the label and definition of the concept	27
			Explaining the definition and attributes of a concept	20
	Asking students to explain by giving examples	1	Asking students to explain by giving examples	16
			Giving divergent examples	15
	Using worked-out examples	1	Explaining non-examples of a concept	14
			Using worked-out examples	14
			Explaining the main proposition and the cause-and-effect relationship in the generalization	12
			Presenting additional examples	11
			Asking students to give examples and non-examples	7
Comparing coordinate concepts			6	
Explaining an example of generalization			5	
Explaining the sub-concepts	4			

Also, it was found that student classroom teachers used the components of generalization less in their lesson plans. Participant 1's view supporting this finding is found below:

Initially, I identified the definition, critical and variable attributes of the concept. While doing so, I mostly focused on using the superordinate concept. Namely, I emphasized that a landslide is a natural disaster (...). In the science course, I presented the critical and variable attributes of the mixtures using images. I asked the students not only to describe the 'examples' and 'non-examples' but also to explain why they thought so; they listed some of the critical attributes of the concept here.

The student classroom teachers mainly used the SOI techniques to teach the concepts in the units, and they taught generalizations less. The justifications for the student teacher's inability to prepare a plan for the instruction of a generalization were their presence in the school only once a week for practicum, their inability to present the information about generalizations in a holistic way, and their lack of sufficient knowledge about students' prior knowledge. Excerpts supporting this finding are:

To me, the reason for my inability to prepare a plan for the instruction of generalizations is that generalizations indicate the relationship of all concepts and facts, but we go to the school just once a week and teach only one concept on that day. We go to the school on Wednesdays, but they learn other concepts on other days, now to build generalizations, I would need to teach all of these concepts, so I could not do it. (Participant 1).

For instance, there is an association between climate and human activities, but students need to know about both climate and human activities so that I can teach them this generalization (...) also need to know whether students know or not. If they were my students, I would know better, but I cannot be sure about what students know or do not know. (Participant 7).

It is not surprising that student classroom teachers seldom used SOI techniques, components of the concept, and generalization in the lesson plans before the training. When the answers given in the pre-test were examined, it can be stated that they do not have sufficient knowledge of these matters. However, when examined in Tables 2 and 3, it is seen that even after the training, the participants could not reflect the SOI techniques and the components of the concept and generalization to the lesson plans at the expected level. This is a finding to consider. For example, despite detailed feedback, P8 showed pedagogical resistance to using SOI techniques. This finding may be due to student classroom teachers' learning and teaching beliefs.

Student classroom teachers' views about the lesson plan feedback and corrections

Table 4 presents the student classroom teachers' views on the feedback and corrections they received for the lesson plans they prepared.

Table 4. Codes and Categories Related to the Student Classroom Teachers' Views on the Feedback and Corrections

Category	Codes
Evaluation	Realizing that they prepared more detailed, clearer, and more comprehensive plans.
	Realizing that they are knowledgeable about the topic and implement the plan in a more self-confident way.
	Realizing that teaching became effective, productive (more participation, easier classroom management).
	Realizing that teaching requires an important responsibility and is difficult.
	Realizing that their presentation skills have improved.
Planning	Realizing that their knowledge about the components of concepts and generalizations have become concrete.
	Thinking about the plan in a more detailed way Thinking about the potential explanations and questions that might be asked by students in the planning process
Regulation	Realizing the missing points about pedagogical content knowledge and the instructional explanations in the plan.
	Realizing that the SOI techniques were not used in the lesson plan Giving up the resistance behaviors for not doing the feedback and corrections

As shown in Table 4, the main category from the feedback and corrections given to the student classroom teachers regarding their lesson plans is the development of awareness in the dimensions of planning, regulation, and evaluation about teaching skills.

In this study, after feedback and corrections, the majority of the student classroom teachers stated that they could prepare an elaborated lesson plan (8 participants), implement the plans



effectively (7 participants), and realized that teaching is a difficult and responsible effort (4 participants). Furthermore, six student classroom teachers stated that instead of planning immediately, they selected the SOI techniques after considering students' potential responses and planned their teaching activities accordingly. Excerpt from the Participant 3 is:

For instance, I asked a student a question. I received feedback such as, "Why are you asking this question? What is its association with the topic?" or "What might students say when you ask this?", when you think of these [questions], you become the master of information, I began to foresee many things.

After feedback and corrections, the participants included components of concepts and generalizations and created mental organizations to reflect the SOI techniques in their lesson plans. On the other hand, findings indicating that the majority of the participants lacked certain aspects of pedagogical content knowledge and could not reflect the SOI techniques in their lesson plans even after the training, their instructional explanations had missing and inconsistent parts and they realized they could revise them with the feedback are among the important findings of this study. A Participant 1's view supporting this finding is as follows:

We had previously learned concept teaching within the scope of the social studies course, but since we could not practice it we could not realize that erosion, landslide, etc. were concepts in the first test you gave us (...). We all had difficulties practicing, what technique exists for what? When I have an objective in front me (...), with which techniques should I support this objective? We all had insufficient knowledge about this.

Another important finding was that the student classroom teachers found the feedback and corrections given to them to be time-consuming, difficult, and tiring at the beginning; however, this pedagogical resistance was found to disappear during the process. Using the techniques of organizing and integrating information in the lesson plan was a very time-consuming and challenging task as it required elaborating on the content and learning-teaching activities. Student classroom teachers stated that they had difficulty in making this effort and allocating time because they were preparing for the public personnel selection exam to be held at the end of the semester. Although the student classroom teachers stated these reasons in the interview (e.g., P2, P8, P10) their insistence on maintaining the traditional structure and practices they are familiar with in their lesson plans may be the main reason for this resistance. However, throughout the process, the importance of making these corrections was constantly emphasized by the researchers, and it was emphasized that they aimed to facilitate students' learning; the participants stated that they consequently gave up the resistance. Participant 10's view supported this finding:

It was tiring. I was busy all day with the plan, and I dedicated hours to make it well. I still received feedback, and I was working on it again. Sometimes, I still did not find it to be good enough (...) I was stuck. While preparing the plans, I was saying, 'Why are we taking this course?' and after implementing the plans I was saying, 'Luckily, we have had this course.'

Student classroom teachers also had self-assessments, and as a result, they seemed to improve their awareness of the importance of teaching, as well as of the components of concepts and generalizations:



There was a photograph; you said it was not clear enough. I had a look at it again and realized that it was not clear enough. I tried to revise the details that I did not notice or give much importance to. I must say that it enabled awareness. For instance, in my definition, I had some missing parts, [so] I revised that definition. I gave the examples and non-examples separately, and you asked me to present them together. (Participant 7).

When the opinions of the student classroom teachers about the feedback and corrections given about the lesson plans are examined, it can be stated that they realize the importance of preparing an effective lesson plan, their deficiencies in pedagogical content knowledge and the difficulties arising from these deficiencies. This lack was an important factor that prevented them from preparing an elaborated lesson plan. Participants stated that they could not benefit from the textbook in terms of pedagogical content knowledge. For example, it was an important difficulty that they could not reach sufficient information in the textbooks about components such as the definition of the concept, examples, explanations of attributes, concept hierarchy. Student classroom teachers tended to use ready-made online lesson plans to cope with these difficulties at the beginning of the practice. However, it was explained to them it would not be functional to use these plans because the ready-made lesson plans did not include SOI techniques and components of concept and generalization. In this study, it was aimed to eliminate these difficulties faced by student classroom teachers with feedback and corrections.

Discussion and conclusion

This study aimed to improve student classroom teachers' content organization skills in a teaching practicum course. Content organisation is a challenging task for student classroom teachers as it is a skill that requires us to consider instructional objectives, students' prior knowledge, teaching environment and activities, materials, and assessment. Student classroom teachers need instructional support in challenging pedagogical tasks (Becker et al., 2019). In this study, 12-hour training was given to support the content organizing skills of the student classroom teachers in the "teaching practicum course". As a result of the research, the post-test scores showed that the student classroom teachers' use of the components of concepts and generalizations and SOI techniques improved compared to the pre-test. Hence, it is concluded that focused training for student classroom teachers and the activities involved in such a process could have positive contributions on their skills in using components of concepts and generalizations and SOI techniques. This finding corroborates previous studies that have revealed the contribution that content-focused training (Becker et al., 2019; Hennissen et al., 2017; Juhler, 2016; Masters & Park Rogers, 2018). For example, Hennissen et al. (2017) reported that pre-service primary education teachers demonstrated an improvement in their cognitive schema of teaching expertise as a result of 10 weeks of training. Further, Becker et al. (2019) found that content-focused training on how to organize teaching goals and strategies and course content improved student classroom teachers' teaching skills.

Lesson plans involve the integration of conceptual and practical knowledge (Borko & Livingston, 1989; Mutton, Hagger & Burn, 2011), and to acquire effective teaching skills, student classroom teachers should be able to integrate these two sources (Darling-Hammond, 2000). Teaching quality could be increased when lesson plans are constructed effectively to support meaningful learning. In this study, after the training, student classroom teachers were able to use the components of concepts and generalizations and content organization tools in

the lesson plans they prepared using the SOI techniques recommended by Mayer. On the other hand, our findings reveal that the student classroom teachers could not reflect the SOI techniques and the components of the concept and generalization of the lesson plans at the expected level. This finding may be because student classroom teachers encountered SOI techniques only in this training and their lack of practical experience in a specific context or they do not use SOI techniques sufficiently in their own learning processes. Although student classroom teachers stated that they had prior knowledge with components of the concept, they had difficulty in transferring the knowledge they acquired into practice. Namdar and Küçük (2018) found that student teachers had difficulties in preparing lesson plans, organising data, and constructing scientific explanations according to the 5E model.

In addition, it was determined that student classroom teachers used the techniques of selecting information more than the techniques of organizing and integrating information. This finding may be because the techniques of selecting information are easier to apply than others and require little cognitive effort. Ding, Hassler, and Li (2021) revealed experienced teachers had challenges in using representations, worked examples, and asking deep questions.

According to Fiorella and Mayer (2016) SOI techniques “aim to motivate learners to actively make sense of to-be-learned information during learning” (p. 720). So, student teachers’ organizing of content using appropriate tools might help them organize their own cognitive structures and, thus, become knowledgeable about the information they must teach. By using these techniques when planning lessons and organizing content, teachers can increase their students’ meaningful learning experiences. Also, it has been reported that student classroom teachers’ experiences in classroom environments could have positive effects on their readiness for teaching in the future (Brown, Myers & Collins, 2019). Then, it can be stated that content organization is important for improving student classroom teachers’ preparation for instructional planning. Student classroom teachers’ possession of this awareness even before entering the teaching profession might help them to provide their students with appropriate cognitive support to use selecting, organizing, and integrating information techniques when they start their profession. Consequently, through classroom implementations, student classroom teachers could improve their content organization skills before starting the teaching profession, thus acquiring experience related to how students learn (Kagan, 1992).

In this study, student classroom teachers used SOI techniques, particularly when teaching concepts: Whilst presenting a concept, participants frequently used the components of a concept in their lesson plans, such as definitions, critical attributes, variable attributes, examples, and non-examples. On the other hand, they used these techniques less when teaching generalizations, although they frequently employed them to emphasize cause and effect relationships. The student classroom teachers’ justification for using these techniques less when teaching generalizations included only visiting the school once a week and having to limit their presentations to just two course hours. In other words, student classroom teachers should first teach the concepts of a generalization so that they can then present the relationship between the concepts used in this generalization to students. However, the student classroom teachers might have preferred preparing lesson plans that involved concept teaching rather than teaching generalizations due to the following factors: the teaching practice time for implementation was limited, they could not plan information about concepts that form generalizations holistically, and they did not have enough information about students’ prior knowledge.

This study demonstrated that the feedback and corrections with which participants were provided had positive contributions on their awareness of lesson planning and content



organization. Student classroom teachers subsequently thought about the lesson plans and mentally prepared them to help their students' meaningful learning, which is an important finding of this study (see Table 4). The literature has reported that feedback provided on teaching practicum encourages student classroom teachers to prepare lesson plans more carefully with consideration of students' learning (Beyer & Davis, 2012).

The participants thought that the feedback and corrections were time-consuming and tiring, but informative and constructive. That could be related to the following factors: They needed to research the feedback and corrections; they realized that their subject matter knowledge and pedagogical content knowledge were insufficient, and effort was required to compensate for this, and the SOI techniques required the preparation of more comprehensive lesson plans. Beyer and Davis (2012) reported that a lack of pedagogical content knowledge and difficulties with implementing knowledge about teaching strategies in lesson plans are important limitations to preparing lesson plans.

In the teaching practice course, it is common for student classroom teachers to use ready-made templates on the Internet instead of organizing the content by considering the conditions of the class, the subject, and the characteristics of the students. In this study, we observed that student classroom teachers who showed pedagogical resistance (e.g., P2, P8, P10) favored ready-made templates instead of attempting to organize the content in the first lesson plan after training. This problem could be attributed to a cultural trend in teaching practice in Turkey.

In this study, all the student classroom teachers had difficulties in using the components of concept and generalization, as well as SOI techniques. However, three participants showed pedagogical resistance to using them in the lesson plan. This resistance may be due to the learning and teaching beliefs of student classroom teachers. In the literature, learning and teaching beliefs are classified as student-centered, constructivist and traditional- teacher-centered (Al-Amoush, Usak, Erdogan, Markic & Eilks, 2013; Bıkmaz, 2017; Richardson, 2003). Learning and teaching beliefs affect the teaching behaviors of teachers and student classroom teachers (Richardson, 2003; Tillema, 2000). In the quantitative studies in Turkey, it has been found that while the constructivist beliefs about teaching and learning of teachers and student classroom teachers are at a high level, they cannot abandon the traditional approach (Ardıç & Uslu, 2021; Bahçivan, 2016; Bıkmaz, 2017; Ekinci, 2017). The cultural context is also important in the effect of student classroom teachers' learning and teaching beliefs on their teaching activities. In fact, the role of cultural context has been revealed in comparative studies (Al-Amoush, Markic, Usak, Erdogan & Eilks, 2014; He, Levin & Li, 2011). Al-Amoush et al. (2014) found that Turkish participants had more moderate beliefs towards teaching and learning than Jordanian participants, while German participants had the most modern beliefs. On the other hand, some studies in Turkey found that student classroom teachers' traditional beliefs are more dominant than constructivist beliefs in teaching practices (Alkış Küçükaydın & Gökbulut, 2020; Bahçivan, 2016). In this study, three student classroom teachers who showed pedagogical resistance used SOI techniques based on constructivist understanding and components of concept and generalization in their lesson plans after feedback and corrections. Then, it can be stated that focused teaching practice, feedback, and reflection have a positive effect on learning-teaching beliefs (Tillema, 2000). Student classroom teachers need well-designed and guided instructional support to acquire skills that allow them to adapt effective teaching strategies to classroom environments (Seidel, Blomberg & Renkl, 2013). Providing constructive feedback to student classroom teachers helps them learn to teach (Becker et al.,

2019). Hence, feedback and corrections given in this study were found to have improved student classroom teachers' teaching skills by providing them with cognitive support, a result that is in line with previous research (Akcan & Tatar, 2010; Brown et al., 2019; Cimen & Cakmak, 2020).

Conclusion, Limitations, and Implications

When the findings from this study were evaluated, we can state that organizing the content in lesson plans and applying them is a challenging process for student classroom teachers. In other words, it is a developing process that requires student classroom teachers to think and reflect on what, how and why they use it. In this process, they need effective and well-structured support from teacher educators (Cakmak, Gunduz & Emstad, 2019).

Since this study's findings were obtained from a few participants, they cannot be generalised to all practices in pre-service teacher education. However, the findings can provide a reference for studies of student classroom teachers' improvement in using content organization skills in designing teaching. Our findings showed that student classroom teachers' knowledge related to content organization was improved through focused training, feedback and corrections, and their ability to prepare more detailed lesson plans was also enhanced.

In this study, data on the effects of student classroom teachers' learning and teaching beliefs on content organizing were not collected. However, it can be thought that the pedagogical resistance that some participants showed in using SOI techniques during the 14-week practice period may be due to their learning and teaching beliefs. In future studies, the relationship among learning-teaching beliefs, pedagogical resistance, and content organizing can be examined in-depth. In this study, student classroom teachers were able to use the SOI techniques, which could be beneficial in teaching components of concepts in their lesson plans. However, they presented a limited number of lesson plans where they used these techniques to teach generalizations. Hence, a future study could be conducted only teaching components of generalization. Also, additional studies may be conducted on student classroom teachers to understand how they learn to implement the SOI techniques in classroom instruction.

The student classroom teachers stated that they had insufficient knowledge about the components of a concept or a generalization. This lack should be eliminated during their pre-service education. In this study, the effects of lesson plans implemented by student classroom teachers on students' learning were not investigated, which is a limitation of this study. Future studies could investigate students' reflections on such lessons. The study also did not reveal student classroom teachers' practices after they start their profession, which is another limitation. Future studies should be designed longitudinally or experimentally.

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Appendix 1. Training and Implementation Processes

Weeks	Training and Implementation Processes	Methods and materials used
1 st week	<ul style="list-style-type: none"> ● Explaining the purpose, importance, tasks of the implementation process, obtaining informed consent of the student teachers. 	<ul style="list-style-type: none"> ● Introductory talk. ● Question-Answer ● administering the pre-test (open-ended) ● Obtaining the pre-training lesson plan
2 nd week	<ul style="list-style-type: none"> ● Content Types (concepts, principles, fact, procedures) ● Concepts and content components of concepts ● Demonstration of the content components of concepts with an example ● Teaching materials used in concept teaching ● Techniques that could be used in concept teaching and rules for content organisation 	<ul style="list-style-type: none"> ● Expository presentation (by PowerPoint) ● Worked example and visual representations (by the concept of mammal) ● Question-Answer, and Discussion ● Reflection (sharing their previous learning-teaching experiences about concept teaching.) ● Implement worksheet ● Provide feedback
3 rd week	<ul style="list-style-type: none"> ● What is generalisation? ● Relationship between generalisation and concept ● Content components of generalisation ● Teaching Generalisation strategies 	<ul style="list-style-type: none"> ● Expository presentation (by PowerPoint) ● Worked example and visual representations (by the law of expansion) ● Question-Answer, and Discussion ● Reflection (sharing their previous learning-teaching experiences about generalisation teaching.) ● Implement worksheet ● Provide feedback
4 rd and 5 th week	<ul style="list-style-type: none"> ● Mayer's SOI techniques and the use of these techniques in concept and generalisation teaching 	<ul style="list-style-type: none"> ● Expository presentation (by PowerPoint) ● Question-Answer, and Discussion ● Reflection (sharing their previous learning-teaching experiences about SOI techniques) ● Provide feedback
6 th -11 th weeks	<ul style="list-style-type: none"> ● Preparing lesson plans for student teachers, containing concept/generalisation components and using SOI techniques, ● Giving feedback and corrections by supervisors ● implementation of reorganized lesson plans 	<ul style="list-style-type: none"> ● Group discussion on how to implement lesson plans in the classroom.
8 th and 9 th weeks	<ul style="list-style-type: none"> ● Microteaching sessions (with only voluntary two student teachers.) 	<ul style="list-style-type: none"> ● Group discussion ● Presentation of plan improvement suggestions by peers and instructors
12 th week	<ul style="list-style-type: none"> ● Individual and group work, ● Preparing the course file 	<ul style="list-style-type: none"> ● Consultation/ interview with individual and group
13 th and 14 th weeks	<ul style="list-style-type: none"> ● Firstly, administering the post-test ● Then, interviewed each student teacher. 	<ul style="list-style-type: none"> ● Open-ended test ● Semi-structured interview form