

# Pre-service primary school teachers reflecting within and on their mathematics teaching practicum

Libuše Samková

Faculty of Education, University of South Bohemia in České Budějovice, Czech Republic

**Abstract:** This paper describes a mathematics teaching practicum we provide at our university as part of the five-year initial teacher education program for primary school teachers, and the way in which teacher trainees reflect on it. The practicum itself is reflective, and its content and organisation differ from the form usual in our country, so that we composed an open questionnaire for trainees that had already completed the practicum and let them reflect on the aspects that distinguish this practicum from the usual ones. The results, illustrated by data excerpts, show what particular aspects of the practicum the trainees did or did not appreciate and why.

**Keywords:** primary school teachers, teaching practicum, mathematics education

Contact: [lsamkova@pf.jcu.cz](mailto:lsamkova@pf.jcu.cz)

## 1 Introduction

Every professional preparation of mathematics teachers includes various types of teaching practicum, either in the form of short-term field experiences at schools (Österling & Christiansen, 2022), or their representative alternatives that take place at the university (Buchbinder & Kuntze, 2018). The particular type, design, scope, and content of these activities depend on various contextual aspects such as the policy of the stakeholders and/or the university, availability of the schools for trainee visits and trainee teaching, etc. (Brown et al., 2019; Wiese et al., 2024).

This paper is about a mathematics teaching practicum organised by our university for prospective primary school teachers in the winter semester of the fourth year of their five-year initial teacher education program. In the past, this practicum used to have the same content and organisation as the preceding practicum in the summer semester of the third study year. Lately, we redesigned the fourth-year practicum to better fit the criteria for quality of practice in initial teacher education (Wiese et al., 2024). Especially, we got inspired by the TRU model (Schoenfeld, 2024) and included more time for reflection and analysis of the lessons taught by the trainees. Like in (Rotem et al., 2024), the reflection is initialised by descriptive talk focusing on critical



incidents chosen by individual trainees, and teacher educator pushes for further explanations while providing contextualisation.

In the qualitative study reported in this paper, we focus on the way in which the new design of the practicum is reflected by the trainees. In particular, we intend to address the following research question: *“How do trainees reflect their participation in the fourth-year teaching practicum, especially in relation to the aspects that distinguish this practicum from the third-year teaching practicum?”* The paper starts with introducing the context of initial teacher education in our country and describing all short-term field experiences that preceded the fourth-year practicum.

## **2 The context of our study**

This study is located in the Czech Republic, where the primary school level is intended for pupils between 6 and 11 years of age, with classes usually having about 20 pupils. Content-wise and grade-wise, Czech primary school teachers are generalists, which means that they are being prepared to teach all subjects of the primary school curriculum, in any grade. Standard initial professional training for these teachers takes the form of a full-time five-year study program provided by a university, while most of its attendees come to the university straight from high school, with little or no previous teaching experience. The study program includes content and didactic courses for all primary school subjects, general pedagogical-psychological courses, and a mixture of various practicums. At our university, the program usually has 60 to 70 new trainees enrolled each year.

### **2.1 Practicums prior our study**

During the first and second study years, the practicums take the form of sitting in on classes. This is accomplished by visiting various rather randomly selected classrooms, either throughout one given week or as two hours per week for the entire semester. In these practicums, the trainees focus on general pedagogical and psychological aspects and reflect on them at related seminars in the weeks that follow.

During the third year, the trainees still visit various classrooms, but the focus changes to subject content of various primary school subjects. The form also changes, to two hours per week carried out at the first and second lessons on Thursday. The visits are organised in such a way that (a) trainees are divided into groups of three, and (b) each group attends the involved school subjects equally during the semester.

As the schedule of the observed classes does not change during the year, condition (b) means that the groups have to switch repeatedly between classes (and sometimes also between schools) to be able to cover the subjects. Within the winter semester, the trainees just sit in on classes; within the summer semester, they also teach. The teaching is carried out by pairs of trainees, and everyone has a turn twice a semester in each of the subjects. The trainees can consult their lesson plans with teacher educators at the faculty; however, no specific time is reserved for these consultations.

In the past, mathematics was among the school subjects included in both the third-year practicums, and the practicum in the winter semester of the fourth year copied them in its content and organisation. Several years ago, we made a change and excluded mathematics from both the third-year practicums, which allowed us to have the fourth-year practicum devoted to mathematics only and redesigned.

## **2.2 The mathematics teaching practicum — overall structure**

The newly designed mathematics teaching practicum is organised in the time frame of two hours per week, and trainees are divided into groups of four. The semester begins with an introductory two-hour session held at the faculty by a teacher educator specialising in didactics of mathematics. During the session, the trainees are introduced to the organisation of the practicum and various templates they will be using: for reflection when sitting in on classes, for planning and reflecting their own lesson, and for detailed didactic analysis of a selected subject-related classroom situation. As the template for lesson planning is the most complex, each group is assigned a homework consisting of planning a lesson for a given page from a mathematics textbook and filling in the lesson plan template. Next week, the groups present their lesson plans and discuss them. Space is provided for various interpretations of the structure and content of the planned lesson so that different perspectives can be expressed independently (Ebbelind & Helliwell, 2024).

For the rest of the semester, the trainees are divided between three teacher educators, so each educator works with 20 to 24 trainees (5 or 6 groups). Each educator has assigned a specific school to visit with their trainees, while each group has assigned a specific class at this school. That is, there is no switching between classes during the semester. The last week of the semester, the practicum is held at the faculty again. It is intended for discussion of mathematics-related classroom situations that each of the trainees was asked to select during the visits and to analyse

it. The task of selecting such a situation for analysis intends to help the trainees keep their attention on content-relevant issues during the visits.

### 2.3 The roles of the trainees during the visits

In the nine weeks when school visits are carried out, the trainees come to their assigned classroom on Tuesday morning and attend the first lesson (which is always mathematics). In the first week, the classes are taught by their classroom teachers, and in all the other weeks by trainees. The teacher educator is always present in one of the classes, but only observes and does not intervene in any way. The content of the lessons taught by the trainees is communicated in advance with classroom teachers, and the trainees can consult their lesson plans with the teacher educator.

Week-by-week, each trainee switches between three different roles: an observer, a shadow teacher, and an acting teacher. The acting teacher teaches the entire lesson. The shadow teacher should be prepared for teaching the lesson, but does not actually teach it (except in cases where the acting teacher could not arrive unexpectedly). The shadow teacher can have prepared their own lesson plan or create one jointly with the acting teacher. During the semester, each trainee becomes twice the shadow teacher and twice the acting teacher.

Depending on their actual roles in the given week, the trainees fill in the templates. Observers submit a structured reflection on the observed lesson (see Table 1), shadow and acting teachers submit their lesson plans and reflect on them (see Table 2). The submissions are checked regularly by the teacher educator and discussed individually with the trainees when needed.

**Table 1.** The outline of the structured reflection template; *some suggestions on answers in italics*

What was the objective of the lesson reported by the teacher?	
Was the hour moving towards achieving this objective?	<i>Deliberate direction / Rather random activities / ...</i>
Did the teacher make any mathematical mistakes?	<i>I did not notice any / I noticed several of them / ... Mistakes I noticed:</i>
Did the teacher speak clearly? In a way comprehensible for pupils?	<i>Expert language but understandable for pupils / Too expert language, pupils could not understand it / Understandable for pupils but not mathematically correct / Unclear and mathematically incorrect / ...</i>
Were the problem-solving methods used during the lesson appropriate?	<i>Methods corresponded to the objectives and conditions / Methods did not correspond ... / ...</i>

Did the teacher or the pupils talk more in class?	<i>The teacher spoke almost constantly / The teacher often asked questions, giving space to the pupils / ...</i>
How the teacher dealt with mistakes made by pupils?	<i>Corrected the error immediately / Asked the other pupils for help / Asked questions until the pupil identified the error on their own / ...</i>
What was the timing of individual activities within the lesson?	<i>Introduction and warming up: 5 min, First task (individually): 5 min, First task (on the blackboard): 10 min ...</i>
Other notes:	<i>Remarkable events etc.</i>

List of questions in the reflection template (first column), and suggestions for answers (second column). The questions cover objectives, speech clarity, methods, communication, dealing with mistakes, and timing.

**Table 2.** The heading of the reflected lesson plan template; *detailed instructions in italics*

What do I expect the pupils to learn?		What do the pupils already know?		
Task assignment	Detailed solution	Tools needed	Organisation of the work	My reflection after the lesson
<i>A snapshot of the assignment from the textbook / How the assignment will be written on the blackboard / How a spoken assignment will be exactly worded / ...</i>	<i>Write down every individual step. If there are different solution procedures you expect to appear in the classroom, write down all of them.</i>	<i>What the teacher or the pupils will need to work on the task, everyday items, didactic aids (abacus, ruler, ...), ...</i>	<i>Expected timing, written or spoken activity, group or individual, using blackboard or exercise books. Indicative questions, evaluation, what to offer to quick solvers, what to advise to those who struggle, ...</i>	<i>Expectations vs reality, pros and cons, highs and lows, unexpected events, implications, modifications made or suggested, possible future alternations, questions that emerged, ...</i>

Upper part contrasts actual knowledge of pupils and new learning expectations. Lower part covers (by columns): task assignment, detailed solution, tools needed, organisation of the work, and own reflection.

## 2.4 After-visit joint reflections

When the mathematics lesson at school is over, the trainees and the teacher educator walk back to the faculty to have a one-hour joint reflection of what was happening in the classrooms. The reflection is led by the teacher educator and is joint for those 20 to 24 trainees that were assigned to the educator. There is a 30-minute break between the lesson and the reflection that serves not only to move to the other building, but also for everyone to sort their thoughts before the beginning of the reflection.

The reflection always starts with reports: each group of trainees shares what was happening in their classroom, how each of the trainees perceived the lesson, and

which questions arose during it. Acting teachers and shadow teachers also compare their expectations, lesson plans, and the actual course of the lesson. The reports are followed by a discussion of possible answers to the questions raised and possible alternations of lesson plans or individual activities. One or two events from the reports are then discussed in more detail, connected to the theory (content, didactics), to the events from previous visits, and to the events from the other classes. In this way, process reflection (Ricks, 2011) is activated. The content and structure of the reflections are inspired and backgrounded by the TRU model (Schoenfeld, 2024; Schoenfeld et al., 2014), especially by the lead questions for planning and reflection (Schoenfeld, 2015) and for observing the lesson through a student's eyes (Schoenfeld, 2018). These detailed discussions focus one-by-one on the five dimensions of the TRU model labelled in (Schoenfeld, 2024) as (1) The Content, (2) Cognitive Demand, (3) Equitable Access to Content, (4) Agency, Ownership, and Identity, and (5) Formative Assessment. We do so from the perspective of teacher as well as student.

## 2.4 Comparing the two teaching practicums

To summarise the differences between the two teaching practicums (the summer semester of the third study year vs the winter semester of the fourth study year), we offer Table 3 with schedules and roles of a sample trainee during the nine weeks of visits at schools.

**Table 3.** Schedules and roles of a sample trainee; abbreviations used: Gr = Grade, Cze = Czech language, Mat = mathematics, Art = arts, Sci = science, Inf = informatics, Phy = physical education, Tch = technical education, OB = observer, PT = pair teacher, ST = shadow teacher, AT = acting teacher, JR = joint reflection

Of the visits:		1 <sup>st</sup> week	2 <sup>nd</sup> week	3 <sup>rd</sup> week	4 <sup>th</sup> week	5 <sup>th</sup> week	6 <sup>th</sup> week	7 <sup>th</sup> week	8 <sup>th</sup> week	9 <sup>th</sup> week
3 <sup>rd</sup> study year, summer	Thu 8:00 - 8:45	Gr 3 <b>Cze</b> OB	Gr 3 <b>Cze</b> PT	Gr 3 <b>Cze</b> PT	Gr 5 <b>Inf</b> OB	Gr 5 <b>Inf</b> PT	Gr 5 <b>Inf</b> PT	Gr 4 <b>Sci</b> OB	Gr 4 <b>Sci</b> PT	Gr 4 <b>Sci</b> PT
	Thu 8:50 - 9:35	Gr 3 <b>Art</b> PT	Gr 3 <b>Art</b> OB	Gr 3 <b>Art</b> PT	Gr 5 <b>Tch</b> PT	Gr 5 <b>Tch</b> OB	Gr 5 <b>Tch</b> PT	Gr 4 <b>Phy</b> PT	Gr 4 <b>Phy</b> OB	Gr 4 <b>Phy</b> PT
4 <sup>th</sup> study year, winter	Tue 8:00 - 8:45	Gr 4 <b>Mat</b> OB	Gr 4 <b>Mat</b> OB	Gr 4 <b>Mat</b> ST	Gr 4 <b>Mat</b> AT	Gr 4 <b>Mat</b> OB	Gr 4 <b>Mat</b> OB	Gr 4 <b>Mat</b> ST	Gr 4 <b>Mat</b> AT	Gr 4 <b>Mat</b> OB
	Tue	JR	JR	JR	JR	JR	JR	JR	JR	JR

9:15 - 10:00										
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Sample schedule showing the way in which the trainees switch between different classes, different school subjects, and different roles during the two practicums.

### 3 The study

#### 3.1 Data collection and data analysis

For our study, we summarised the main aspects in which the fourth-year teaching practicum differs from the third-year one, and transformed them into an outline of a written open-ended questionnaire (see Table 4).

**Table 4.** The structure of the open questionnaire

During the mathematics teaching practicum, I appreciated:	
• that we spent the entire semester at the same class	YES/NO
because:	
• just 1 lesson per week at school	YES/NO
because:	
• the possibility of teaching on my own	YES/NO
because:	
• the joint reflection of my own teaching	YES/NO
because:	
• the joint reflection of my classmates' teaching	YES/NO
because:	
In this practicum I missed/disliked:	

List of aspects to express or not the appreciation and explain why: entire semester at the same class, just one lesson per week at school, teaching on my own, joint reflection of my teaching, and joint reflection of others teaching. At the end, they might specify what they missed or disliked in the practicum.

We assigned the questionnaire to the trainees at the beginning of the next semester, that is, approximately two months after the last school visit. Their task was to check yes/no for each item on the bulleted list and to give detailed reasons. Then they commented in general on whether they missed or disliked anything during the practicum. Finally, we asked the trainees to rank the individual bulleted items from most to least appreciated and express this ranking by numbering the items (1 = most

appreciated). The questionnaire had a double purpose, it served not only as a research tool but also as an informal course evaluation.

Data collection was anonymous, and the trainees had the option to refuse participation in the study by a tick at the top of the paper. No one used this option; however, two participants submitted a blank questionnaire. Of the 60 full-time trainees who enrolled in the mathematics teaching practicum this academic year, eight were not present when the questionnaire was assigned. That is, we got 50 non-blank questionnaires — these were our data materials. We labelled them H01 to H50.

For data analysis, we choose qualitative design based on open coding (Miles et al., 2014). First, we coded the reasoning provided as answers to the open items. We were looking for displays related to various aspects of teaching practice, compared them with each other, and then searched for patterns. Additionally, we also monitored the yes/no checks and the ranking of the items.

### 3.2 Results

Aspects of teaching practice that appeared in data were miscellaneous: learner, teacher, observer, interactions, materials, tasks, lesson planning, instruction, curriculum, classroom culture, affect, reflective teaching, multiple approaches, learning from mistakes, learning from others, sharing experience, etc. In the text below, excerpts that are listed together are sorted according to the diversity of perspectives included in them: from single to multiple, and along the patterns found.

By the ranking, the trainees most appreciated the opportunity to teach on their own (modus = median = 1, mean = 1.44); all checked it YES. The second most appreciated was the entire semester in the same class (modus = 1, median = 2, mean = 1.86); only two trainees checked it NO and explained that they would prefer a change of classes in the middle of the semester to be able to experience teaching of pupils of different grades. Those who indicated YES commented on various advantages that visiting the same class brought to them:

I got to know the class better and was able to tune in to it. (H05)

I know the pupils, I know the curriculum, I know what to expect from them, their pace. (H09)

The children had more opportunities and more time to get used to me and I to them, and then the lessons went better. (H11)

I had a better time working with the class (I understood more why some pupils were not working). (H15)

Thanks to this, I had the opportunity to get to know the pupils better, see how they react, and then adjust the teaching in the next lesson. (H44)

As for joint reflections, reflections of trainees' own teaching were more appreciated (modus = median = 3, mean = 3.12) than reflections of classmates' teaching (modus = median = 4, mean = 4.34). However, most trainees checked both items YES and expressed their appreciation for both types of reflection:

*Response to: Own teaching reflection / Classmates' teaching reflection.*

I get the feedback (what I did well and what I didn't). / Everyone may perceive it a little differently and it's good to hear more opinions. (H08)

I know what to do differently or better next time, what to avoid. / It will give me more experience and I can think about what I would do in their place. (H11)

It was beneficial to hear different opinions. / We could be inspired by others, or perhaps learn from certain mistakes (sometimes it was comforting to know that I am not the only one who is not 100% satisfied with my teaching). (H14)

I realized my mistake and came up with different solutions to the problem that I would not have thought of. / I learned about topics other than what we were discussing in relation to our class, or about different approaches to the same topic. (H15)

I like to hear the opinions of others, which is a great benefit for my subsequent practice. Above all, the unsuccessful activities and the subsequent reflection on them provided by others move me forward. / I like to be inspired. During joint reflections, I appreciated the opportunity to hear the summary of the lessons taught by my classmates. (H33)

I am in favour of a joint reflection on my outputs. Although it is often not comfortable and "pleasant", it brings additional perspectives and observations on the given situation, which I perceive at that moment perhaps differently than my classmates who were watching the lesson. / See the previous point. But I would not mind having a reflection only with the group with whom I went to the same class. (H24)

Only six of the trainees checked NO/YES, or NO for both types of reflections, usually based on their own discomfort or dissatisfaction during the reflections:

NO: Considering that I have trouble discussing in front of my peers, I would appreciate private reflections, but I understand that it is necessary to share my experiences. / YES: If they have no problem with it, it is good to draw on other experiences and ideas for teaching. (H40)

NO: I didn't feel comfortable at the seminar. / YES: I could get ideas for future lessons. NO: I had to publicly and openly criticize my classmates, even though they knew what they did wrong. (H10)

NO: Classmates are not always able to give constructive criticism and say what was wrong and what was good, unlike the teacher who normally teaches in the given class. / NO: It was not very beneficial for me, unlike the classmate who was teaching. (H12)

The most diversified were the opinions on the extent and frequency of the visits: 27 trainees checked it YES, and 23 NO. However, those who checked YES ranked it

highly, so that the item did not end up last (modus = median = 4, mean = 4.24). The YES checks usually appreciated enough time for lesson preparation and reflection:

I was able to focus on the lesson in more detail and reflect on it. (H02)  
 We had enough time to prepare for the lesson and process our feelings. (H08)  
 I think that was enough for me to start with. Since it was my first such practice in mathematics, the preparation took me quite a long time. (H45)  
 Due to the time-consuming nature of the reflection, I think one hour that is thoroughly discussed is better than multiple hours where we get no feedback. That would have lacked the most important point for us as trainees. (H34)

The NO responses mostly generally called for more frequent or more intense teaching practice:

I would appreciate more practice → more experience. (H17)  
 I think we could have managed more hours at this point and teaching practice should prevail in our schedule. (H32)  
 I would rather appreciate continuous practice (e.g. a week-long). (H43)  
 In such a short time, it is difficult to catch different pedagogical situations, get to know the pupils, and better understand the dynamics of the class. It can also be uncomfortable for the pupils themselves when someone different comes to the class every time. (H22)

Several trainees checked NO but at the same time gave reasons why more frequent teaching visits would not be ideal:

I think it would be good for us to teach more than two hours per semester, but at the same time it is logical that we cannot replace their math teacher in the classroom for more days a week. (H09)  
 I would definitely appreciate more of these teaching practice lessons. I think they gave me a lot. It's important to put everything I learn into practice.  
 Disliked: I found that it was not easy to prepare the lessons. It always took me an awful lot of time. And that was only for one hour of teaching. (H38)

## 4 Discussion

As an answer to the research question: *“How do trainees reflect their participation in the fourth-year teaching practicum, especially in relation to the aspects that distinguish this practicum from the third-year teaching practicum?”*, we can state that the trainees mostly appreciated the changes in the structure and content of the practicum we had made, and provided us with elaborate reasoning that led them to this opinion. They most appreciated the opportunity to teach on their own and the ability to stay in the same class for all their visits to the schools. Diverse opinions were

expressed on the extent and frequency of the visits, where approximately half of the trainees considered one lesson a week enough and greatly appreciated this frequency, but the other half considered it not enough. The reasons behind “enough” usually referred to the necessity to prepare carefully for the lesson and therefore have enough time available between individual lessons, while the reasons behind “not enough” called generally for more teaching and/or observational experience.

Regarding the reflections, six of the trainees were not comfortable with the “public” format; however, at the same time, some of them presented reasons why such reflections are valuable to them and/or their classmates. Positive responses from those who appreciated the format showed that the trainees were aware of the importance of both types of reflection (on their own teaching, on classmates’ teaching) and the way in which they could build on them. In this way, the new design met expectations for the quality of the practicum (Wiese et al., 2024). From the perspective of teacher educators, the TRU model (Schoenfeld, 2024; Schoenfeld et al., 2014) has proven to be a great help in this endeavour. The lead questions for planning and reflection (Schoenfeld, 2015) informed a lot of our discussions, and the questions for observing the lesson through a student’s eyes (Schoenfeld, 2018) became a valuable integral part of them. The class-by-class and trainee-by-trainee reports at the beginning of the joint-reflection hour created a stable background for the reflections, by letting voice the whole spectrum of various views and interpretations (Ebbelind & Helliwell, 2024) and revealing practical rationality of the trainees (Brown et al., 2019). Such an environment enabled not only descriptive talks on current events that the reflections started with, but also higher quality levels of reflection given in (Rotem et al., 2024) and brought to attention interconnections between past, current, and potential future activities (Ricks, 2011).

The questionnaire findings served as background for designing a follow-up seminar conducted the next semester. The seminar was again devoted to mathematics, this time to intensive work with various types of representations of practice (for sample activities, see Buchbinder & Kuntze, 2018; Samková, 2021). The focus, content, and structure of the seminar were adjusted according to collected data.

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