

Unfolding the assessment process in a whole class mathematics setting¹

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Assessment activities in the class are an important aspect of classroom practice, while there is much debate with respect to the formative vs. summative assessment routines and the outcomes that each of them provides for students' learning. As classroom assessment does not occur in seclusion of other aspects of classroom life, the process is seen as rather complex. In this study we wished to explore how assessment serves the function of supporting students' learning and whether this evidence is used to adapt teacher's practices in meeting different learning needs in the mathematics classroom. The authors observed assessment practices of an experienced math teacher in a grammar school in Belgrade. Teacher's assessment practices were observed during a three week period. The analysis has shown the teacher to hold a somewhat complex perception of assessment, yet the perception is largely detached from teaching, which is in line with the previously reported results. However, the elements of formative assessment do emerge, thus contributing to the assessment being in service of learning. In spite of this, a narrow set of practices are visible when observing how the teacher keeps track of students' progress. A mismatch is visible between students' and teacher's perceptions of the assessment as a whole and some of the practices exercised in the process. The teacher struggled to verbalize some aspects of own assessment practices, especially those related to more formative aspects.

Key words: assessment practices, mathematics, teacher's and students' perspective

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Introduction

Assessment activities are an important aspect of classroom practice (Havelka, Hebib & Baucal, 2003; Pegg, 2003; Malinić & Komlenović, 2010). Recently there has been much debate in respect to the formative vs. summative assessment routines and the outcomes that each provides for students' learning (Taras, 2005). It is argued that one of the most important reasons for the complexity of classroom assessment is the fact that assessment does not occur in seclusion of other aspects of classroom life. Rather, it is accomplished within a social and educational context in which a variety of seemingly straightforward interactions are influenced not just by the circumstances of the moment, but by expectations and understandings deriving from much longer established and taken-for-granted practices (Torrance & Pryor, 2002). These authors also emphasize that teachers themselves seem to regard "assessment" as a separate activity from "teaching". When they do assess students' learning it is to gather data for third parties – for purposes of accountability – rather than for their own benefit and (or) the benefit of their pupils. While some teachers acknowledge informal classroom assessment as an important activity (e.g. communication with and observing of pupils), it is considered rather too intuitive to merit them a great deal of attention. Thus, summative assessment prevails. Earlier reviews (Natriello, 1987; Crooks, 1988; Black & Wiliam, 1998; Hattie, 2009) have demonstrated that learning achievements are likely to be significantly improved when teachers introduce formative assessment into their classroom practice. Yet, effective implementation of formative assessment is often difficult to reach because it asks for (a) more complex teaching competencies, (b) transformation of dominant teachers' practices and education policies, and (c) initial education of teachers to become less content-wise and to support student teachers to develop beliefs and skills that make them able to provide students with scaffolding for learning.

In this study we wish to explore how assessment serves the function of supporting students' learning and whether this evidence is used to adapt teacher's practices in meeting different learning needs in the mathematics classroom.

Different faces of assessment

Giving school grades is one of the basic activities a teacher performs in the classroom and perhaps one of the most sensitive ones. The effects of professionally grounded school grading are seen in an overall improvement of teaching and learning, students' attitudes towards their teachers and school, students' motivation for learning, as well as their overall engagement in both school and out-of-school activities (Havelka et al., 2003; Hattie, 2009).

As a process, assessment encompasses several activities. These include planning of assessment, monitoring and evaluation of teaching and learning,

evaluation of students' improvement and providing feedback to students (Clarke, 2001; Havelka et al., 2003). Havelka and colleagues (2003) argue that each of these activities has a specific role, but taken together they provide continuity in the follow-up and evaluation of both students' progress and the quality of the teaching process. This means that the functions of grading can be observed both in relation to students and in relation to teachers and the teaching process.

With respect to students, assessment serves to inform students of their progress and has a developmental function (conditioned by students' and teacher's mutual agreement on the next steps of learning); it motivates students through particular actions teachers perform to elevate students' self-confidence and interest, and it is there to evaluate students' progress in mastering a specific content. Of course, all of these functions are mutually interwoven. In relation to teachers and the teaching progress, assessment again serves to inform on the activities previously performed by the teacher and allows teachers to assess own activities when teaching in relation to students' performance (the analytical-evaluative function), opening the floor for the correction of specific moves or introducing new activities in the process of teaching (the corrective-innovative function).

It is argued that teacher's professionalism is mirrored in his/her ability to critically analyse the objects of learning, the activities involved in the teaching and learning process including students' activities, along with the data showing students' progress in learning. However, the practice often shows the latter to be regarded as a separate activity from teaching, which inevitably leads to the position in which assessment is not seen as the basis for improvement of practice (Torrance & Pryor, 2002).

When we talk about assessment practices, they are mostly seen on the pole of the formative versus summative assessment. The basis for their separation lies in the role each has in the overall assessment process (Hattie, 2009). Although both formative and summative assessments are focused on evaluating the effects of the learning process, within formative assessment one assesses these effects during the entire process (Black & Wiliam, 1998; Bennett, 2011). On the other hand, in summative assessment, one assesses (something) at the end of the predefined periods (e.g. mid-term, end of the school year). During the process of formative assessment, pieces of information obtained in the previous steps that were assessed serve as a guide for the actions to come, whereas in summative assessment the basic goal is to evaluate the effects and outcomes achieved in the previous period, i.e. the extent to which the students have mastered specific objectives of learning determined by the curricula (or teaching programme). Within formative assessment, the follow-up is done in specific units of time; each is however used to guide and shape the steps ahead. Thus, we can understand formative assessment

as more guiding, processual and stimulating grading, allowing the student to take both active and constructive role in own process of development and learning (Torrance and Pryor, 2002; Taras, 2005). To summarize, formative assessment involves all teacher's practices which provide such feedback to students about their learning that will encourage and support their further learning and progression (Havelka, et al., 2003; Hattie, 2009).

Summative assessment, on the other hand, is a sort of a creating a balance sheet on what has been achieved at the end of the specified periods. Within our system, we encounter several forms of summative assessment such as taking final exams, providing an average grade at the end of a midterm and term, as well as giving students grades at the end of the predefined time slots (e.g. after mastering a specific content). Giving grades in the latter case may also include grades based on teacher's informal observations of students' accomplishments. From the perspective of the function it serves, summative assessment is more attuned to providing information of the student's status in different situations outside of teaching (e.g. evidence of the type and the level of educational attainment or the selection of candidates according to their school achievement). However, it should be noted that if a teacher assesses students during a specific time period (e.g. mid-term), both formative and summative assessment can be interwoven. Summative assessments are partially grounded in teachers "informal" observations and summative assessments may be followed by an explanation which has the same structure and purpose as those given as a part of the formative feedback (Havelka et al., 2003).

In Serbian schools, assessment practices for the most part are focused on giving the student a numeric grade, thus marking his/her success in appropriation of the content that has been the subject of teaching in an earlier period. In such case, assessment is not truly part of the teaching and the learning process, but rather operates as an isolated activity which is only performed temporarily, after certain period of teaching. The students mostly take written tests or are assessed orally through questioning. Although it cannot be argued that teachers do not take into account their previous observation of particular student's engagement during the teaching process, it remains unclear how these "observations" are valued and to what extent they are used in the same way by different teachers within the system (Havelka et al., 2003).

Some studies have shown (e.g. Black, Harrison, Hodgen, Marshall, & Serret, 2011) how targeted actions at the school level may substantially contribute to the assessment quality and put into dialogue both its summative and formative aspects. Contrasting different practices related to assessment in the classroom, Newmann and colleagues (2001) found that students whose teachers used what they call "authentic classroom tasks" (defined as requiring construction, rather than reproduction of knowledge, disciplined inquiry, and value beyond school) did better than students not given such work. In

a study conducted by Boaler (2002) practices in two schools were compared. The author concluded that students from the school that used a “reform” approach to the teaching of mathematics, emphasizing higher-order thinking and students’ responsibility for their own learning, outperformed students from the other school, which used a “traditional” approach, emphasizing practice of test items.

In assessing the effects of various science teaching strategies on achievement Schroeder, Scott, Tolson, Huang and Lee (2007) found that among the strategies associated with the highest effects are those connected to strategies teachers exhibit when assessing their students. The findings of Malinić and Komlenović (2010) suggest students believe their teachers have different evaluation criteria, and that these are less severe when evaluating the weaker students. Students also believe teachers apply assessment as a disciplinary measure and are often under the influence of students’ grades in other subjects when giving their own assessments. The grading itself is a strong motivator for active engagement of students in the learning process, during which students especially value when assessment is done objectively and on a regular basis and criticize the excessively strict and uneven grading criteria.

Practices in mathematics classrooms

Teachers around the world walk into classrooms with own conceptions of teaching, learning, curricula, assessment, and their students (Brown, 2004). Evidence so far indicates that our educational practice is to a great extent knowledge-oriented. Students remain for the most part supported in the acquisition of academic knowledge and skills rather than in developing key competencies (European Commission, 2002; Eurydice, 2010). The dominant form of teaching and learning practices is the frontal delivery of subject knowledge, coupled with the passive role of students and encouragement of memorization as an opposite to understanding of what is to be learned. Active learning, inquiry-based learning and project learning are rather incidental (Ivić, Pešikan & Antić, 2001; UNICEF, 2001; Mintz, 2009; European Commission, 2007). Pavlović-Babić and Baucal (2010, 2011, 2013) emphasize the issue to be visible in the results our students achieve in the PISA survey, while one of the main explanations for the pattern of the results students achieve can be found in the fact teaching and learning in our schools is still typically directed towards the appropriation of academic knowledge, with traditional lectures being the widespread form of teaching and learning.

Looking at the context of mathematics teaching in our country, Radišić and Baucal (2012, in press) report on distinguishing four teaching styles in their study (1) ‘laissez faire’ (an eclectic approach to teaching, the absence of structuring and creating atmosphere practices with the experience of

low capacity in maintaining discipline); (2) 'traditional' (the absence of participating and creating atmosphere practices, a more traditional approach to teaching); (3) 'traditional stressing atmosphere' (structures activities in class, stresses atmosphere, an experience of high capacity in maintaining discipline) and (4) 'modern' (creates atmosphere, stresses students' participation, a more modern approach to teaching). More than 80% of mathematics teachers were found in the two traditionally labelled groups, characterized with the frontal delivery of subject knowledge and students' mostly passive role in the process. Other authors report the most frequent help students in Serbia seek in the form of private tutoring is related to difficulties in mastering math content (Pešić & Stepanović, 2004), while current assessment practices provoke anxiety (Videnović & Radišić, 2011).

Building on the results of four distinguished teacher types (Radišić, 2011; Radišić & Baucal, 2012, Radišić & Baucal, in press) and the fact that mathematics teachers are mostly present in the traditionally labelled clusters, in this study we wished to explore: (1) to what extent assessment supports students' learning, i.e. how specific practices performed by the teacher support students' progress, and (2) whether evidence gathered in the process is used to adapt teacher's practices in meeting different learning needs in mathematics classroom (e.g. adjusting the pace of activities, prolonging time for practicing on different problems). For that purpose, the authors observed how a typical representative of a dominant cluster of mathematics teachers (the 'traditional stressing atmosphere' type) assessed knowledge and advancements of her students during a three-week period, which ended with students taking a test about the contents they were previously taught.

Methodology

The current study is a follow-up of a previous research aiming to explore teachers' beliefs and their own practice (more details may be found in Radišić 2011; Radišić & Baucal, 2012; Radišić & Baucal, in press). The study aims to investigate the extent to which dominant beliefs and practices are invariant of different class settings, while analysis is focused on teacher's assessment practices. The study is organized through a sequential explanatory mixed-methods research design (Creswell, 2008; Teddlie and Sammons, 2010), which means that its focus is on qualitative data, whereas quantitative data were collected to better illustrate the processes analysed on the qualitative set. All of the data concern the practice of one teacher who also participated in the previous study. The teacher was purposively chosen for the current follow-up as she was a typical representative of a dominant cluster of mathematics teachers that were singled out in the previous research (the 'traditional stressing atmosphere' type; for details see Radišić 2011; Radišić & Baucal, 2012; Radišić & Baucal, in press). From the previous study we

had information of the teacher's overall conception of the teaching and the learning process. At the time of the current study, the teacher had 30 years of experience serving as a math teacher.

Data Collection

Qualitative phase of the study involved videotaping of six consecutive lessons in two classes of the selected teacher (twelve in total). Both classes were held with third-year students in the same grammar school in Belgrade, at a language and social science track (65 students in total) and were taught by the same teacher, teaching identical mathematical content to both classes – *determinants*. Lessons were videotaped with two cameras (one focusing on the class and the other on the teacher). The researcher was present during the videotaping. All lessons were filmed while following regular school programme in mathematics. After video materials from the two cameras were joined together, all video sessions were transcribed using conversational analysis approaches (Sacks, Schegloff & Jefferson, 1974; Lerner, 2004). During the analysis, the following aspects were in the focus: the type of the activity during the lesson and how turn taking unfolds within each, the type of interaction between the teacher and the students, how content is displayed during the lesson and the general atmosphere in the class. These aspects were observed from the perspective of mathematics instruction and assessment in mathematics. Upon filming of the lessons, interviews with the teacher and four students in each class (two with a lower and two with a higher grade in the previous period³) were made concerning their perception of class atmosphere, practices in mathematics lessons and the feedback the teacher provides to the student (Appendix 2).

Quantitative data collection included gathering information on students' achievement (subject grade and test grade), and students completing a questionnaire concerning their practices related to mathematics class, math self-concept, math self-efficacy, math anxiety and math related activities at home. All but the last scale were organized as a 4-point Likert type scale (math self-concept, math self-efficacy, math anxiety scales 4 – I do not agree at all to 1 – I fully agree; practices related to mathematics class scale 1 – at every lesson to 4 – never or almost never). A set of questions related to students' practices at home was organized as open-ended questions. The examples of items within each of the scales are given in Appendix 1. Additionally, copies of students' notebooks and tests were gathered. Although a great span of data was collected in the study, the focus in the results section will be on those relevant to the assessment practices.

3 A "higher grade" refers to grades 4 and 5 in the last classification period, whereas grades 3 and below are classified as "lower". Thus, we label the former as "stronger students" and the latter as "less strong students".

Results

The comparison of the two classes in which the study was conducted showed no differences in respect to the math self-concept (M-W U test⁴=340,50, $p=0.236$), the perception of self-efficacy (M-W U test=345,00, $p=0.265$) and math anxiety (M-W U test=375,00, $p=.843$). A consecutive analysis of the less strong (grade below or equal to 3 in mathematics) and stronger students in both classes revealed the less strong students to be less anxious in respect to mathematics (M-W U test=662,00, $p=0.000$). This result was also confirmed by the results obtained from interviews with students, which revealed that the less strong students exhibited less ambition for liking mathematics and believed no outside factors can contribute to them being more interested in mathematics. In comparison, the stronger students (mathematics grade in the previous period was 4 or 5) reported being more anxious and felt they cared more about the outcome.

As for the atmosphere in math class, overall students perceive being supported by the teacher and that they can ask the teacher for help (around 75% of students stated that the teacher supported or supported in most cases the students' learning and gave or gave in most cases the additional support when needed), as well as that there is discipline during the lessons (more than two-thirds of students). With respect to math activities at home, almost none of the students took additional lessons in mathematics either at school or out of the school premises, very few reported on seeking help from parents when not being able to master a specific content, while 52% reported not doing homework in mathematics at all.

After five consecutive lessons that were videotaped in each of the classes, both classes took a test assessing the contents they had learned during the previous five lessons (the sixth videotaped lesson in a row). Class A achieved better results on the test ($\chi^2=14.190$, $df=4$, $p=.007$). The follow-up revealed no significant differences with respect to an average mid-term grade between the two classes, although class A exhibited a wider grade span⁵.

Organization of mathematics lessons

The analysis of math lessons that were filmed showed a set of typical activities to be present in both classes (Graph 1), with a very similar amount of time devoted to each. Administrative activities such as row calling are situated at the beginning of the lesson, followed by teacher demonstration and practicing on math problems. The teacher mostly addresses the whole class, while during the practicing math problems sections of the lesson teacher's focus is attuned to the student in front of the board.

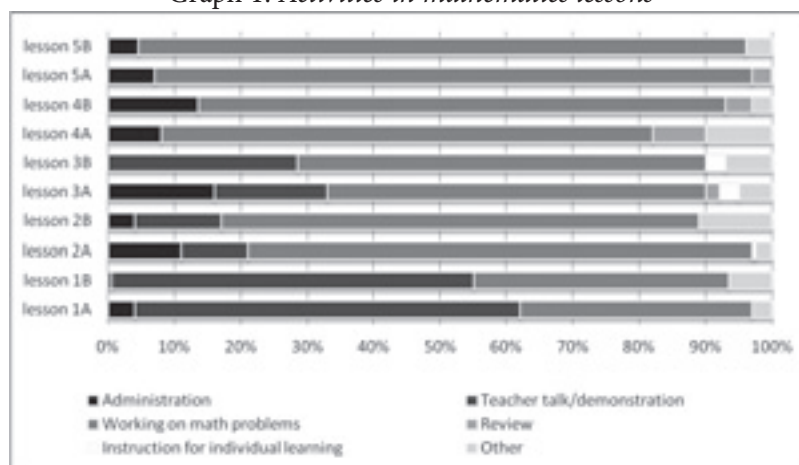
4 The Mann-Whitney U test.

5 Conclusions are based on the descriptive data of student's mid-term grades.

Based on the qualitative results from the interview, the teacher states that she is there to teach the students and give them the knowledge they need. She particularly stresses the atmosphere in the classroom, but at the same time says that her voice is the one students will hear throughout the lesson, as she is the one structuring the activities in the class. Finally, it is important for her to establish a rapport of mutual respect with the students. As for the activities present in the lessons, the teacher emphasizes that practicing math problems is an important part of each lesson as this allows the students to apply theoretical concepts, and her to follow the extent to which they mastered a specific content. After a topic has been finished, the knowledge is always tested.

Upon the triangulation of the data gathered in the study, especially those relative to the assessment practices, in the following segment we will focus on two topics: teacher’s and students’ concept of assessment and assessment practices captured in the study, namely, practicing math problems and taking the test.

Graph 1. *Activities in mathematics lessons*



Note: Activities presented in this figure do not depict an actual time flow in each of the lessons but rather the share of time devoted to each type of activity. ‘Lesson nB’ refers to a lesson being filmed in class B, and ‘lesson nA’ in class A. Lessons during which students took the test are not depicted in this graph.

Concept of assessment – contrasting students’ and teacher’s perspective

Interview data reveal teacher’s conception of assessment to be divided in several segments. First, she argues to hold general criteria, but still does make a difference between the classes she has in math-science and language and social science tracks. She tends to be stricter with the former (both classes in this study are at the language and social science track).

In her account, to get a grade 2 in math means that the student is exhibiting an effort, but he or she needs constant teacher’s support. The

teacher states she will be there to give that support. This is in line with the student questionnaires' data. When speaking of grades 3 and above, the teacher states these students show independence when dealing with math problems and consistency over the year. *Shades* in that consistency make the difference between grades 3, 4 and 5.

As for the grading span, the teacher emphasizes that she grades her students using the span from 1 to 5 (as prescribed by the legislation), but does add that grades 3 and above for her are the 'real' grades.

"Two is not really a grade, three has to be more independent in resolving problems, while grades four and five are completely independent throughout the school year" (Teacher)

Besides mastering the mathematical content, the teacher also grades students' overall participation in lessons. These grades are given at the end of a mid-term and school year. However, while describing this aspect of assessment, the teacher has struggled in describing the features she actually holds significant to assess. It is important for her that students realize that what they do when someone is solving a math problem in front of the board does matter, and she finds it especially difficult to grade those classes she has 'inherited' from colleagues. To the end, she remains inconclusive in verbalizing the criteria used to assess this aspect of her students' practice. Finally, the teacher does add it is up to the student to take responsibility for own success, and not the teacher.

Students' accounts portray a somewhat different picture. While they are aware that general criteria differ between math-science and language-social sciences track, grades seem to be the main way in which they mirror own contributions and success in mathematics. Some students state that in communication with their math teacher they have never received any information on how (un)successful they are and in what regard, which makes them even more inclined to rely on the grades they receive. Others do inform of receiving praise. One student explains how this issue is resolved: *"When she says she doesn't want me in front of the board then I know she knows I know"*. Interestingly enough, teacher's support is not associated with assessment, while active participation during the lessons is *'something you do if it's going to get you a grade'*.

Following up on students' progress

Teacher and students' interview data, along with those from the video observations, suggest that teacher's focus is on whole class situations, while she directly communicates in most occasions with a small number of students. Again as per accounts of the teacher and the students (confirmed also during the observation period), the questioning for the duration of math problem solving sequences and tests are the means for keeping track of students'

progress. Peer feedback is seldom present and is only visible in those instances when a student in front of the board makes a mistake. One of the peers may correct him/her but no other follow-up by the same peer is made.

Box 1. Type of the problems resolved during the lessons
(given examples are the same in both classes)

$$\begin{vmatrix} 3 & 4 & -5 \\ 8 & 9 & -2 \\ 2 & 1 & 8 \end{vmatrix} \quad \begin{vmatrix} -i & i+1 & 1 \\ i & -1 & i \\ i-1 & 1 & 2 \end{vmatrix} \quad \begin{vmatrix} 3 & x & -4 \\ 2 & -1 & 3 \\ x+6 & 1 & 1 \end{vmatrix} = 0$$

Over the course of five consecutive lessons that were examined in each class (the sixth lesson was used for taking the test), math problem sequences make for a substantial part of each lesson (Graph 1). During these, there seemed to be no specific pattern related to how a student gets to be chosen for solving the math problem. Students who bid for the floor were given the chance first. In the course of lessons, the teacher keeps track of the students in front of the board to some extent, but not all of them get to solve the task in this way, which raises concerns about the way in which the progress of all students is evaluated. If we assume that students who mastered a specific content more quickly were those who bid for the floor and these are given a chance to “publically” solve a problem, it remains unclear from the videotaped lesson how this opportunity is systematically given to the less strong students. Not all of them will solve the problem in this way nor there will be time to do so. At the same time, during solving math problems sequences the teacher focuses on the steps performed by the student in front, and not on the rest of the class (e.g. there is no checking of students’ notebooks practices).

If we look at the types of problem being solved during the lessons per se (Box 1), all of them fall into the category of formal mathematical problems, which dominate our schools. We examine one typical math problems solving sequence.

Excerpt 1. An example of the situation of solving
a math problem in front of the board

- 1.teacher: **Di:mitrije will now use the second rule** (1.0)
you can write on the other board ((*there are two boards, the left and the right one, Di-mitrije is stepping out from his seat*)) (7.0)
here it go:es (.) the first line is 1 2 -3
- 2.student: second
- 3.teacher: second -2 -1 0
- 4.student: thi:rd
- 5.teacher: and the thi:rd (.) -3 3 4 (.) **Cyrus’s rule**
(.) **what did we say?** (.) what did the man

- say how it is done? (.) **we add the first two columns** (.) let's do that
- 6.student: I just put a line
- 7.teacher: **no li:ne is necessary** (.) **you just add two columns**
- 8.student: (*looks puzzled*) it has to be the first two or any two?
- 9.teacher: not any two (.) **the point is to always respect the rule** (.) so we a::lways add the first two: (.) multiply and write down (.) do not pull all the lines right away (.) write the product first (.) 1 -1 4 (.) it will be
- 10.student: hm::
- 11.teacher: let's play
- 12.student: -4
- 13.teacher: -4
- 14.student: then 0
- 15.teacher: ah: (.) a:ll right (.) let's move on

In the example shown above, student Dimitrije has bid for the floor and now he is solving the problem. The teacher keeps close track on what he is doing and provides him with instruction. Even more so, she gives a short remark at the very beginning how the problem will be resolved, that is, by using one of the two procedures she has previously taught in the class. During the solving process, the teacher also provides feedback on the specific aspects of the procedure that is to be applied (lines 1, 5, 7 and 9). This feedback is in the function of the learning process, thus having elements of the formative support. However, this episode will also serve as one of the indicators for the grade on class participation Dimitrije will eventually get. Summative elements are thus equally present.

Over the course of the three-week period the teacher's practice was followed, very few differences were observed between the lessons in the two classes involved. About one third of students in each class got the chance to practice math problems publicly. During the interview, the teacher stated that after she had observed that around 70% of the students mastered the content, she moved on. However, she was unable to verbalize which indicators she used to make such an assessment.

Students' perceptions of the math solving sequences are somewhat mixed. While some students, especially those that fall into the stronger students group, stated they can keep up with the pace, others disliked the fact they actually did not have the time on their own to try to solve the problem, which would then be followed by a public display of the procedure in front of the

board. Thus, it often happens that students do not have the time to check their own solutions, especially if they followed other procedures than those displayed on the board. Here is an account of one of the interviewed students. As can be seen from the example, the way that the pace of that part of the lesson is organized does not fully allow all of the students to keep track of own progress:

“She gives you the task, but you don’t get five minutes to work on it before someone goes out front, one goes straight away, ... so I start to work, he starts to work, we do not look at each other ... how should I explain it now? I do not look around, I do my math problem, just as the person in front of the board, ... and then at the moment he stops, when we both finish solving if my result is not the same as the one on the board ... even when I get to ask and correct it, automatically you have another problem being given and I don’t make it ...”

Upon the completion of the topics defined within the teaching programme students take a test. The activity was observed during the videotaping of the lesson. In teacher accounts this is the second major indicator of the extent to which students mastered a specific content. This grade also serves to place students in a continuum in relation to other students and constitutes a part of their final grade.

When taking the test, students are usually divided in two groups and receive five problems they need to resolve (again all are formal mathematical problems), together with a sixth math problem, the so-called “joker”. If solved correctly, this task can be used as a substitute for one of the other five.

Although students receive grades for taking the test, which is a balance sheet on the amount of the mastered content they were previously taught, it is important to note that grades are received at the level of points achieved in the overall test. This means that the teacher is not focusing only on the correctness of the final result but rather takes into the account the correctness of both the procedures and the result. Even though the teacher is aware of the importance of the process of solving itself, the assessment takes place after a particular topic has been taught, which is in line with the logic of the summative assessment. Yet, by giving points for each part of the problem that is correctly resolved the teacher acknowledges students’ effort, the fact that the student has tried to solve the task, although the final solution may not be fully correct. In this way, the teacher clearly emphasizes the importance of proper procedures in mathematics and not only the result.

The scoring procedure was communicated to the researchers prior to the test and the feedback that followed. The researchers thus followed the lesson during which the results were communicated to the students (no videotaping of this lesson was made). The grades were read to the students aloud within a whole class setting. Each student received their own copy of the test. The analysis of these showed a clearly marked final grade, together with the

scoring for each problem the student solved. However, no comments were made of students' achievement, whether students systematically had problems with some of the tasks etc. No individual feedbacks were provided either, nor were the results in any way put in the service of the future learning steps. Rather, all grades were written in the register book and a new topic from the teaching programme was introduced.

Discussion

In this paper we have tried to examine the assessment practices of a typical teacher of the 'traditional stressing atmosphere' group and the extent to which her assessment practices may serve to support students' learning, as well as whether the evidence gathered in the process is used to adapt her practices in meeting different learning needs in the mathematics classroom (e.g. adjusting the pace of activities).

The results point to the conclusion this teacher (a typical representative of the 'traditional stressing atmosphere' type) holds a belief that assessment is largely detached from teaching, which is in line with the results reported by Torrance and Pryor (2002). The elements of formative assessment do emerge, which contributes to them being in service of learning (e.g. when the teacher observes the progress of students when solving math problems in front of the board). Notwithstanding, a narrow set of practices are visible when observing how teacher keeps track of students' progress. A mismatch is visible between students' and teacher's perceptions on the assessment as a whole and some of the practices exercised in the process. The teacher struggles to verbalize some aspects of her own assessment practices. The analysis also showed the teacher to clearly structure the activities in class, stress the importance of good relations with her students, and feel highly competent in maintaining discipline in class. The teacher states she is there to teach the students, and to give them the knowledge they need.

When talking about assessment, the teacher speaks of it and the related practices on several levels. Firstly she holds general criteria, which she applies differently for students attending two different grammar school tracks. She elaborates on the meaning of each grade and what is being graded, yet struggles to explain those elements of own assessment practice that mainly serve to keep track of students' progress and participation, which is in line with previous reports of Havelka and colleagues (2003). Based on students' responses it is unclear how the meaning of specific grades is communicated to them, especially having in mind different experiences they report on in communication with the teacher.

If we look at the issue from the perspective of the summative vs. formative assessment practices we may argue both are present in the practice of the

teacher who was the focus of our analysis. However, summative elements are far more present and easier for the teacher to explain. For the students, summative practices (getting the grade) are clearer and serve as the main channels for informing them on “how good” they are in mathematics. Other practices such as continuous participation during the lessons are something they do to get the grade, they do not serve to support their learning nor do students see teacher support (of which they do inform) as part of assessment practices in mathematics class.

Questioning and tests are the dominant formats when following students’ progress. Both contain the elements of formative and summative practices. Questioning in the form of solving a math problem in front of the class serves a dual purpose. A student will receive a grade for this activity, but at the same time the activity allows the teacher to keep track of student’s progress. Students’ accounts speak in favour of the fact that current practices related to solving a math problem in front of the class are not matched to their needs in full, as the current pace does not allow them to solve the problem by themselves and then check for the solutions. Different learning needs of students are thus not fully met.

Similarly, test taking will get students to receive a grade, but the teacher also takes into account the procedure students followed and not just the correct result. Still, the summative aspects of the test assessment seem to prevail, as information on students’ results is not fully embedded in the teaching and learning process nor seems to be used in order to adjust the specific routines in the classroom according to students’ needs (e.g. students do not have additional time to check their own results when practicing problems in the class if they used other procedures than those displayed at the board). We may relate these teacher routines to teacher’s accounts that she is there to give students the knowledge, and yet that they are responsible for their own success. Again, such a statement is in line with the views of teachers belonging to traditionally oriented teaching methods as previously reported (Radišić 2011; Radišić & Baucal, 2012; Radišić & Baucal, in press). The teacher thus remains the content specialist rather than a mathematics teacher, i.e. a specialist with the knowledge on specific determinants of the learning process and the way it unfolds in the classroom setting. Her role is to present the knowledge, whereas after the exposure comes assessment with primarily an evaluation purpose and not the purpose to support further learning, although some elements of practice do speak in favour of formative assessment

One may ask why such assessment practices prevail in typical teachers in the Serbian education system. Several factors do not work in favour of the transformation of typical math teaching, learning and assessment. Firstly, the initial education of math teachers has prepared them mainly for the transmission of specific knowledge as well as for the assessment of

appropriation of students' knowledge, and not to become teachers. Secondly, the school programmes and textbooks are also focused on the transmission of knowledge. Finally, in spite of the existence of rule books on how the assessment should take place in the classroom, the lack of more explicit criteria hinders the procedures teachers employ, whereas the students are often left to intuitively guess the teacher's criteria, which again hinders their own capacity for self-evaluation.

Conclusions

In this study we have examined how assessment serves the role of supporting students' learning and whether this evidence is used to adapt teacher's practices in meeting different learning needs in the mathematics classroom. For that purpose, the practices of an experienced math teacher were analysed. Although the generalizability of the findings may hence be called into question, the teacher was purposively chosen based on the data of the previous study conducted by the authors and the fact that she was a typical representative of a dominant cluster of mathematics teachers that were singled out.

The results of the current study speak in favour of the need to include more elements of formative assessment into overall mathematics teaching practice. This means teachers need support in the development of the assessment process to its optimum, putting it in the function of both own and students' development, since only when assessment is truly part of both teaching and learning we may speak of "effective practices". However, for the process to be effective as a whole, the role of what it truly means to be a teacher, a subject teacher and a mathematics teacher needs to be redefined in the minds of our teachers. Based on the results of both this and the previous study, the authors are developing an intervention study in order to explore how both practices and sustained beliefs may be altered and under what conditions this is possible.

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Analiza procesa ocenjivanja na časovima matematike

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Aktivnosti ocenjivanja na času predstavljaju važan aspekt prakse u učionici. U isto vreme, debata o prednostima i značaju formativnog ocenjivanja spram sumativnog i dalje se nastavlja. Ocenjivanje se ne odvija izvan okvira svakodnevne prakse u učionici, pa se, samim tim, na ocenjivanje gleda kao veoma kompleksan proces. U ovom radu želimo da istražimo način na koji se ocenjivanje stavlja u službu učenja učenika i da li se informacije koje nastavnik kroz ocenjivanje prikuplja koriste (ili ne) kako bi se svakodnevna praksa nastavnika u nastavi matematike prilagodila raznovrsnim potrebama učenika. Za potrebe ovog rada autori su pratili nastavnu

praksu iskusnog nastavnika matematike u jednoj gimnaziji u Beogradu. Prakse ocenjivanja nastavnika posmatrane su u periodu od tri nedelje. Analiza pokazuje da nastavnik poseduje kompleksnu predstavu o tome kako ocenjivanje u učionici treba da izgleda, ali je percepcija toga u velikoj meri odvojena od nastave, što je u skladu s prethodnim nalazima. Međutim, elementi formativnog ocenjivanja se pojavljuju, pa doprinose tome da se ocenjivanje nađe u službi učenja. Uprkos tome, kada se поближе posmatra način na koji nastavnik prati napredak učenika, evidentiran je ograničen skup praksi. Uočen je i nesklad između percepcija učenika i nastavnika u vezi s procesom ocenjivanja i primenjenim praksama. Takođe, nastavnik se suočava s teškoćama kada treba da verbalizuje neke od aspekata sopstvene prakse, naročito ako se oni vezuju za formativne karakteristike procene postignuća učenika.

Ključne reči: ocenjivanje, matematika, perspektiva nastavnika i učenika

APPENDIX 1.
Example of items from the questionnaire

Scale	Example items
<i>math self-concept</i>	a) I am simply not good at mathematics. b) I get good <marks> in mathematics. c) I learn mathematics quickly. I feel confident ...
<i>math self-efficacy</i>	a) Using a <train timetable>, how long it would take to get from Zedville to Zedtown? b) Calculating how much cheaper a TV would be after a 30 per cent discount c) Calculating how many square metres of tiles you need to cover a floor
math anxiety scales	a) I often worry that it will be difficult for me in mathematics classes. b) I get very tense when I have to do mathematics homework. c) I get very nervous doing mathematics problems.

APPENDIX 2.

Themes investigated in the teacher and students' interviews

Teacher interview

- previous teaching experience
- practices related to mathematics classroom
- conception of assessment and developed practices
- understanding of the learning process

Students' interview

- overall interest in mathematics
- description of mathematics lessons
- practices related to learning mathematics bot at school and home
- perception of mathematics teacher

APPENDIX 3.
Transcription symbols (Jefferson, 2004)

[]	overlapping
=	latching
hm	backchannelling
(2.0)	pause
(.)	micro pause (less than 0.2 sec)
↑	falling intonation
?	rising intonation
! or ↓	exclaiming intonation
,	continuing intonation
-	abrupt cut-off
:	prolonging of sound
–	stressed syllable
((abc))	indicates comments added by the transcriber
()	indicates a non-transcribing segment of talk
(abc)	indicates the transcriber is not sure about the words therein
°abc°	quiet speech
>abc<	quicker speech
<abc>	slower speech
“abc”	reported speech
ABC	high tone
abc	a segment of special interest for the researcher