

ASSESSMENT PRACTICES IN SCHOOL MATHEMATICS: ACTING AND DEBATING

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Assessment practices influence and are influenced by a number of educational as well as social factors. The present study looks at these practices of five primary teachers displayed in the mathematics classroom and in a relevant pedagogical discourse developed in the context of an interview. The results show that, on the whole, their practices were rather conventional and did not differ much between the two contexts, demonstrating weak frames of practice and interpretation.

INTRODUCTION: SOME THEORETICAL ISSUES

The assessment of the educational process is one of the most significant functions of an educational system. Its significance in the educational process lies in the classroom itself and the school environment in general, as well as in the educational policy, which characterizes and is being characterized by the political-ideological framework in which it is exercised. In the school context, assessment is used for the shaping of an effective learning environment, but it also determines the degree and the form of support pupils should be given on an individual as well as collective basis. At the same time, the results of educational assessment constitute strong evidence for the evaluation of educational policies. The formal procedures and practices of assessment are used in classifying children, while the results of assessment constitute the basis upon which decisions about their future are taken. Thus, along with the educational aims it serves, assessment, it could be argued, performs a number of political and social functions in contemporary societies.

The above points highlight the complexity of the assessment process as well as its significant contribution to the formation of the identity of the educational system, the teacher and the student. More importantly though, they show the necessity to consider assessment practices in the school as well as in the wider social environment where they are exercised, the role of the latter being catalytic in the formation of these practices. In this perspective, it is deemed important to study systematically the procedures of assessment a teacher adopts in the classroom. The focus is on the teacher, since he/she is the most powerful, undisputed participant in the educational process and therefore, the main carrier and formal ‘factor’ in these procedures (Filler & Pollard, 2000).

Assessment and teaching practices are closely related to the teacher’s identity. This is constructed from his/her inner, personal views and ideas as shaped by external cultural influences and the expectations of specific groups operating in the wider society (e.g. parents, educational officials etc). This “internal-external dialectics” (Jenkins, 1996) determines the practices of teaching and assessing a teacher adopts in the classroom. However, these practices are also shaped to a great degree by the conceptions teachers form concerning their pupils and the school environment. Consequently, the features that

characterize teachers' practices as well as their understanding of their students should be examined in conjunction with the differentiated answers provided by the latter in a given school environment (Filler & Pollard, 2000).

This differentiation in the students' answers can be interpreted in the light of an epistemology beyond the traditional, according to which there is not necessarily a relation between a student's 'text' and the meanings the teacher, as a reader of the text, constructs. On the contrary, the messages formed depend on the features that the reader distinguishes in the text. These features vary according to the pedagogical discourse within which the text is interpreted, and the positionings adopted by the teacher-reader within this pedagogical discourse along with his/her previous experience. Kress (1989) argues that the text itself constitutes an "ideal reader", presenting a reading position from which there appear to be no problems and is "natural". However, readers do not necessarily adopt the "ideal" position. Consequently, there is no guarantee that the interpretations teachers as assessors offer are exactly the same as those of their pupils (Morgan, 2002). In other words, the teacher proceeds to assessments subjectively. The differentiation in assessment results seems to be related to the degree of subjectivity in judgements, since teachers do not judge as a whole in the same subjective way. Moreover, they do not have the same subjective judgement in all cases and in all subjects in the school curriculum. The degree of subjectivity differs not only between teachers but also between subjects. As a result, assessment seems at times to be an informal, spontaneous function and at others a formal, clearly defined operation, which has probably been taught or pointed out. In studies concerning teachers' assessment practices, in both formal and informal settings, emphasis is put on the fact that the features teachers consider as contributing to the validity of their assessments can only be discovered through examining the practices of teaching and assessing their students (Morgan, 1996).

Assessment in mathematics is often seen to be equivalent to an evaluation of the level of understanding achieved by the pupils. Morgan (2000) advocates that this approach to assessment in mathematics rests on two hypotheses: a) pupils have characteristics such as skills, abilities and knowledge that can be identified and measured and b) the principal role of assessment is to reveal and measure these characteristics. Both these hypotheses are based on the belief that, theoretically speaking, there is a fundamental "truth" in mathematics to be discovered and measured; however, this emphasis on the measurement of children's achievements is very restrictive, as it does not allow for the complexity and entirety of the assessment process to be appreciated. That is, it does not allow for the pupils' work to be understood in relation to the power structures developed in the classroom, the school and the wider society. Hence, in looking at assessment in the everyday classroom, the social nature of mathematical behavior, theories of pedagogical discourse and communication, as well as a sociological analysis of the role of education, mathematics and assessment all need to be taken into account. This highlights the importance of carefully examining the practices of assessment utilized by the teacher and identifying his/her informal assessment behavior, which constitutes a significant element of the entire assessing function.

THE STUDY

The study presented here constitutes part of a larger project which aims at studying teaching and assessment practices in school mathematics as well as the way in which these practices are related to teachers' conceptions of mathematics, its learning and teaching. In this paper, the focus is narrowed down to an examination of the assessment practices employed by teachers within the mathematics classroom and the pedagogical discourse developed in interpreting these practices. In particular, an attempt is made to address the following research questions: a) "What are the main features characterizing assessment practices both in the classroom and in teachers' pedagogical discourse in school mathematics?" and b) "How do these features differ in the two contexts?"

The sample consisted of five primary teachers (four males and one female), all of whom had 15 to 23 years in service. Two of the subjects were teaching senior classes (5th, 6th grade), two intermediate level classes (3rd, 4th grade) and one a junior class (1st grade). All were graduates of Pedagogical Academies (two years courses) and had attended a number of in-service training programs, while some had participated in a number of innovative projects in education.

Two research tools were used for the collection of the data: observation of mathematics lessons and interviews with each teacher. Specifically, five lessons were observed and videotaped, one for each of the five teachers. Teachers were told to act "as normal" and try to follow their "usual" approach. The interviews were semi-structured and thematically divided into three parts. The first concerned the teacher's educational background (undergraduate, postgraduate studies, in-service training), his/her professional and more general scientific profile (participation in conferences, research projects, etc) and their teaching experience. The second part of the interview concerned issues related to the nature of mathematical knowledge, the teaching and learning of mathematics (11 questions), while the third part concentrated on aspects of assessment in school mathematics (11 questions). Each interview lasted for an hour and 45 minutes, and took place outside the school environment. Both the observations and interviews were carried out in the spring term. The videotaped lessons and tape-recorded interviews were transcribed; the transcripts constituted the research data.

DATA ANALYSIS AND DISCUSSION

Teachers' assessment practices were studied on the basis of their actions while teaching mathematics, whereas the pedagogical discourse they develop around this issue was examined via their answers to the questions of the interview. In addition, the subjects' views and conceptions concerning mathematics, its teaching and learning as expressed in the interviews or as they emerged in the classroom, were also used to "fill in the gaps" and provide more flesh to the data.

In order to analyze the assessment practices employed in the classroom and displayed in the interviews of the five teachers, Tsatsaroni et al's (1997) suggested categorizations were adopted; namely: (a) *emancipatory-implicit criteria (E)*: assessment, if not rejected as a reproductive mechanism, operates in a combined way, for both the educational process and the class itself. It contributes to the acquisition of a critical attitude towards knowledge, (b) *informal-implicit criteria (I)*: assessment focuses on the learning process

and procedures rather than on the individual child, and (c) *formal-distinct criteria (F)*: pupils' assessment takes place individually and is based on the use of an "objective" scale. It is characterized by distinct criteria and focuses on performance.

In the following, some distinct features of the assessment practices revealed by each of the five teachers in the sample, first in their teaching and then in their interviews, are briefly presented.

a. Assessment practices: teaching sessions

Orpheas: Assessment takes both an oral and written form. It allows for a revision of what the students have been taught. The students are asked to solve exercises similar to those done in class (*formal-distinct criteria*).

Notis: Assessment is carried out through solving the exercises in the textbook as well as other exercises provided by a supplementary book. The teacher checks the answers to the solved exercises and signs the pupils' notebooks. The latter do the exercises individually and address the teacher only when they have finished solving them (*formal-distinct criteria*).

Aris: The teacher gives his students handouts with exercises. Each student finds the answer on his own and then goes up to the teacher to announce it in a secretive way (*formal-distinct criteria*).

Sophocles: The level of the students' understanding appears to be closely related to the result (*formal-distinct criteria*).

b. Assessment practices: interviews

Orpheas: "The student's assessment in a written form is standard: either he has done the operations or solved the problem correctly, ...or he has made a mistake in solving it, in which case the teacher sees that the student hasn't understood it.... They know most of the criteria. Based on what I ask, the students know that they will be assessed in the very same things.... Assessment in written form is more important especially in mathematics. While being assessed in writing, the student is focused on the question; he/she will think hard enough to answer and what he/she will answer, stays" (*formal-distinct criteria*).

Christine: "When I have to hand in grades formally, then I am obliged to have a standard line of reference according to which I will grade the students...what they can achieve as a whole....Then I seek another way of assessment" (*formal-distinct criteria*).... Each time a teacher should assess the students individually, according to what each of them can do.... I believe the students observe the teacher's behavior and sooner or later they figure out what the teacher wants" (*informal-implicit criteria*).

Sophocles: "I think that assessment in written form is more effective.... One of the things I take into account when assessing is how the student has performed on his/her tests Every two weeks the students take a test I prepare to see how they are doing ... I return the tests with a grade on" (*formal-distinct criteria*).... Oral assessment takes place daily, in order for the teacher to have a complete picture for his students; oral assessment complements the written form of assessment....I believe that as the teacher gets to know his/her students, in the same way they get to know their teacher, what points he/she

insists on, what his/her demands are, what he/she likes to listen to” (*informal-implicit criteria*).

In order to increase their validity, the data were analyzed separately by the two researchers. A detailed discussion concerning the meaning of the different categories took place beforehand. Based on the results of this “double” data analysis, which hardly differed, table 1 was constructed.

Table 1: Teachers’ classification according to assessment practices

Source of data	ASSESSMENT PRACTICES		
	E	I	F
<i>Teaching sessions</i>			
		A, S, C	A, S, O, N,
<i>Interviews</i>			
		A, S, C, N+	A, S, O+, C

Note: 1. A = Aris, S= Sophocles, C=Christine, N = Notis, O = Orpheas

2. “+”: The evidence for the specific classification is clear/ Absence of “+”: The evidence is satisfactory.

As table 1 shows and confirmed by the interviews, the teachers present a quite distinct and stereotypical picture regarding mathematics and its teaching. With slight variations, they appear to see mathematics as a static body of knowledge, which the pupil is asked to ‘conquer’. Their teaching actions suggest that they believe the teacher to be in possession of a specific number of clearly defined criteria, known to students, which are used to assess whether they have acquired the “right” mathematical knowledge. It is worth noting that two of the teachers (Aris and Sophocles) employed assessment practices both of an “informal” and “formal” type. This could be attributed either to their uncertainty and/ or possible confusion with respect to more contemporary practices of assessment, or to the fact that these teachers had come to realize how limited the formal means of student assessment are, and they were consciously trying to broaden their scope.

On the whole, the way the teachers appeared in the interviews did not vary significantly from the way they appeared in the teaching sessions. However, there are a few “shiftings” worth mentioning. In particular, two of the teachers (Christine and Orpheas) seemed to interpret assessment practices in a slightly more ‘conservative’ way compared to what they actually did in the classroom. An explanation of this could lie in the particular characteristics of these two teachers. Orpheas is the oldest of the teachers involved in the study, very confident, with some in-service training and a strong interest in local authority politics. Christine, on the other hand, is in her late thirties, with a fair amount of hours of in-service training, very enthusiastic and eager to learn, but with little time to spare, as she is very devoted to her family. They are both very articulate and have strong, on the whole traditional views about mathematics and its teaching and learning. Thus, it could be argued, the limited training opportunities of these two teachers in conjunction with their strong personalities did not allow them to essentially ‘update their

pedagogical discourse'. However, Christine's great interest in the educational process motivated her to explore alternative assessment practices in the classroom; this is less the case with Orpheas, who is not as flexible and seems to have lost interest in classroom matters. On the contrary, one teacher's pedagogical discourse (Notis) indicated a more relaxed 'reading' of the assessment practices compared to those he exercised in the classroom. It could be that in the interviews, the teachers, removed away from the reality of the classroom, might express more "open-minded" views and be more receptive to alternative practices compared to the ones they use in reality.

The preceded analysis offered an overview of the assessment practices employed or debated about by the teachers in this study. However, it does not allow for an appreciation of the particular features of these practices. To this purpose, and in order to increase the validity of the interpretations provided above, the data for each of the teachers involved in the study were analyzed at a more detailed level, thus providing a kind of profile for each of them. In the following, the profiles of two representatives of the sample are presented in short.

Aris

Teaching: For Aris, the assessment criteria focus on the individual performance of each student through frequent oral questions, mainly requiring recollection from memory. He asks his students to give "*mathematically logical answers*", "*to work as if they were mathematicians*", but does not explain to them what a mathematically logical answer means to him. Consequently, the students are not given the opportunity to familiarize themselves with the rules that would allow them to work and behave in ways the teacher expects them to. The assessment criteria he uses are often so indistinct that can only be seen through careful examination of his practices. Assessment takes place both orally with questions and in writing with activities.

Interview: Aris believes that he states directly to his students principles and assessment criteria, and he puts greater emphasis on oral assessment. He argues that there are times when the student's ability to use language appropriately interferes in the assessment of the mathematical knowledge the student has acquired. Written assessment is considered formal but he regards the oral form as more effective. According to Aris, the level of understanding can be detected in the students' answers. The announcement of the assessment results in class is done verbally and concerns mainly each student's performance. Aris states that he avoids announcing indirectly the assessment results to his students but does not deny the fact that this may happen at times. In his assessment practice outside the classroom, he makes comparisons between students, while he takes into account other elements such as the effort the student makes, his participation in the lesson etc. Finally, he believes that mathematical knowledge cannot be measured.

Orpheas

Teaching: For Orpheas, assessment is carried out both orally and in writing. Written assessment includes exercises similar to those found in the textbooks. This confirms his view – articulated in many ways in his interview – that revision plays a decisive role in the successful acquisition of mathematical knowledge.

Interview: Orpheas believes that assessment measures the students' ability to handle and apply the things they have been taught. He considers formative assessment to be more important for students. He uses oral assessment during the lesson, asking questions to his students. He depends on the students' answers to assess how much they have understood. The students' behavior and attitudes influence Orpheas to a great extent when he starts to get to know his students, but this impact becomes less as he gets to know them better. He considers written assessment more important and appropriate, especially for mathematics. He insists on the importance of the written assessment because he believes that the student has time to think in order to answer, and his answer is considered evidence, while in oral assessment, the student has to think very fast. Summarizing, Orpheas shapes the content of the mathematical knowledge his students are asked to acquire and he, himself, states to what degree they have understood. Consequently, he is in a position to point out which of his students' work is mathematically correct. Finally, he believes that assessment can measure the mathematical knowledge that has been grasped by the pupils.

CONCLUDING REMARKS

The analysis of the data showed that the assessment practices employed by the teachers of the sample in the classroom did not vary significantly from teacher to teacher, and reflected rather conventional views: mathematical knowledge is difficult; students are expected to either simply reproduce it or to acquire it, and whatever the case, the results can be measured. To assess the level of mathematics understanding achieved by the pupils, the teachers frequently but informally used oral questioning. Written assessment was less popular but considered more formal in character. In all cases, tasks requiring mere recollection from memory or straightforward application of mathematical knowledge dominated. The assessment criteria were never clearly articulated to the students and the results of the assessment were poorly communicated to individual pupils. As a result, students were uncertain as to the value of these results, and tended to either eventually ignore them or to interpret them as a way of comparing themselves to their fellow students. Furthermore, there were teachers whose assessment practices were not always consistent to one another, indicating confusion and / or uncertainty with respect to their stand to this.

This picture did not change very much in the interviews, thereby underlining its stability and power. The teachers' pedagogical discourse concerning assessment practices was more or less compatible with the actual practices they exhibited in their teaching sessions. The explanation of this situation should be sought in the past (and current) pre-service and in-service training systems, especially with respect to mathematics, as well as in the wider educational and social contexts. These systems appear to be failing in helping teachers to develop a clear and deep understanding of theoretical and empirical issues concerning the subject matter and its teaching and learning. As a result, teachers become insecure in handling and articulating a well-structured pedagogical discourse that would assist them to activate alternative frameworks of interpretation for the related educational phenomena, and develop alternative practices in the classroom. This is predominately the case with assessment practices, as they have immediate and often overwhelming effects on the pupils' lives and future careers. The strict, centralized, often oppressive and impoverished educational and social frameworks within which today's schools operate,

stabilize and even worsen this reality. It is clear that more research on the ways in which teachers' knowledge and conceptions of mathematics, its teaching and learning are formed and influence the development of flexible and effective practices in the classroom is needed.

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