

MATHEMATICS FOR PERFORMANCE AND THE “UNIQUE MANUAL”

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Abstract: *The return to the “unique manual” raises questions from many points of view: preparing the National Testing, as well as the exams, contests and Olympiad, and even capitalizing the potential for performance. We considered that it is natural to ask the question: to what extent can the performance training be achieved with the help of the “unique manual”? The paper aims to address these issues.*

Keywords: “unique manual”; Mathematics; performance; training;

1. Introduction

What will be understood through performance in the present paper is “an exceptional achievement that exceeds the level customarily achieved” (Mircea, 2006, p. 269). Also, “performance is the extent to which an individual successfully solves a problem or task; degree of acquiring certain contests, skills, knowledge, attitudes” (Schaub, Zenke, 2001, p.219), and again, “performance is the result that a learner gets from a learning activity is a measurable, sometimes measurable result ... In turn, performance demonstrates the existence of a gained competence, in fact it is the way to prove the achievement of the intended goal. So, performance in this sense is not an end in itself, but an indicator of the student's progress” (Mircea, 2006, p. 269).

The basics of performance training in Mathematics are placed in primary school, where optional mathematical activities lead to the improvement of children's creativity and logical thinking, the development of their interest in the application of mathematical knowledge in various contexts.

The possible factors that concur to obtaining performance in Mathematics are studied in several papers, some of which will be presented below. “More recent studies point to a positive correlation between student attitudes towards mathematics and student academic achievement.” (Mata, Monteiro, Peixoto, 2012, pp. 1-2). Other factors include: “differentiated classroom instruction, flexible grouping, and immediate intervention for students who are not mastering math standards give students the individual instruction they need to succeed in math. Teacher collaboration, within and across grade levels, acknowledges the importance of year-to-year continuity in mathematics instruction. The quality of math teachers, particularly with regard to their content knowledge of mathematics, is critically important.” (Improving Math Performance-US, Department of Education, p. 5). K.R.Wenzel and A. Wigfield consider that “to remain engaged in math, students' must have a sense of a task's interest, importance, or utility value” (Wenzel, Wigfield, 1998, p. 158), also that “academic performance can be explained, in part, by the sets of goals that students pursue” and that “students' motivation is crucial to their school success” (Wenzel, Wigfield, 1998, p. 162).

Requirements for mathematical performance are individual work, participating in many school competitions and Olympiad, attending specialized training, actively involving the family in the child's life with encouragement, incentives and permanent support. Of great importance as well is the existence of competent teachers to deal especially with super-talented students who are eager to develop mathematical performance in this field, to engage with dedication, to constantly keep the pupils' interest for study and to motivate them.

Studies of the relationship between self-beliefs and performance tend to draw on this or related theories and usually endorse the notion of reciprocal determinism at a substantive–theoretical level. However, attempts to model this postulated mutual influence of self-beliefs and performance are few and are focused on the relationship between self-concept and performance. The reciprocal determinism of self-efficacy and performance seems to be without direct empirical support, probably because the longitudinal, repeated-measures data often considered necessary for this purpose are not available. It is possible, though, to model reciprocal effects with cross-sectional data” (Williams, Williams, 2010, p. 453). M. Bong and E.M. Skaalvi give some ways to predict performance: “The theoretical and operational definitions of the constructs, when compared, also create the impression that self-concept embodies fairly stable perceptions of the self that are past-oriented, whereas self-efficacy represents relatively malleable and future-oriented conceptions of the self and its potential. Despite these differences, self-concept and self-efficacy are used to predict a fairly similar set of outcomes including motivation, emotion, and performance.” (Bong, Skaalvi, 2003, pp. 9-10).

An important contribution to training for school competitions with a view to achieving performance, are school textbooks. Sutherland considers that “Mathematics textbooks are used in different ways by teachers, but almost every country produces its own textbooks and these reflect the beliefs and practices of a particular mathematics education culture” (Sutherland, 2007, p. 24).

In the present paper we address the issue of Math performance from two perspectives: firstly, from the point of view of the National Testing and secondly from that of the school contests and Olympiad, connecting them to the “unique manual”. In addition to these approaches, we also intend to address the issue of the “unique manual” in a differentiated way, on educational levels: primary and secondary. In Romania, the return to the “unique manual” raises questions from many points of view: preparing the National Testing, as well as the exams, contests and Olympiad, and even capitalizing the potential for performance. The question we want to answer starting from the above considerations is: to what extent does the “unique manual” open a door to these issues?

2. Performance in National Testing and “unique manual”

A.Revuz observed that “the problem is not to convey a ready-made science but to make achieve a way of thinking” (Revuz, 1970, p. 58). This means that any dogmatism must be avoided. The Mathematics teacher must not reproach to the discipline itself for being abstract. Mathematicians note, not without humor, that what a generation qualifies as abstract is often considered as concrete by the next generation.

The way to look at any novelty in mathematical performance cannot be separated from the current curriculum vision. An important role in achieving Math performance in National Testing is the unique or alternative manual. Until now, alternative textbooks, using a wide range of exercises and problems with different levels of difficulty (marked with one to seven stars) lead the student from simple to complex, preparing him/ her for National Testing. In order to prepare pupils for national exams, we believe that the “unique manual” must meet some criteria including: providing examples of applied Mathematics; containing a sufficient amount of solved/ proposed exercises and problems, necessary to enhance students' knowledge; containing enough examples of subjects given at national exams (if we want to eliminate some of the numerous auxiliary materials).

Regarding the training for the national examinations at the primary level, we consider that if the conception of the “unique manual” is properly done, according to rigorous criteria, this type of manual could prove very useful. With regard to national testing in the 8th grade –

a decisive event in a student's life – we believe that in addition to the usual exercises and problems aiming to understanding and deepening, the "unique manual" should contain at least 40 tests, resembling those given at the National Testing. In this way, all students will have access to these evaluation tests and can thus verify their level of knowledge. We believe that these things should also be taken into account when thinking about the „unique manual” for upper secondary level and especially for the 12th grade.

3. Performance in Contests/ Olympiad and “unique manual”

The alternative textbooks, through the above mentioned "problems with stars", also make an "opening" to school competitions. We say "opening", considering there is no perfect recipe for success in these competitions. However much we would like to, we do not know all the factors and parameters that lead to success.

In order to prepare pupils for contests/ Olympiad, we believe that the "unique manual" must satisfy some important criteria including offering problems with a slightly higher degree of difficulty to incite the quest and to cultivate the curiosity that is so necessary for the pupil with potential, for the future Olympic student. We believe it is necessary, but not sufficient, that the "unique manual" should also provide examples of problems encountered in such competitions.

In the past 8 years, in Brasov, Romania the training for the Math Olympiad (district and national level) is also done by performance training programs for students, where experienced and dedicated teachers present to the selected students chosen themes with many examples of "beautiful problems". We ask ourselves the following question: should not those "beautiful problems" be a part of the Mathematics manual, being thus the "trigger-factor" for the desire to achieve this kind of performance? If the answer to this question is the one we deduct, then we consider that a selection of this type of "beautiful problems" should be made by the authors of the „unique manual” and included in it.

There is still a problem specific to the district level of Mathematics Olympiad, namely related to the choice of too difficult topics for that level, which leads to very low scores for the majority of the participants. We all know that in order to "get closer" to the discipline of Mathematics we need to have a lot of diplomacy and not to lack encouragement for the smallest successes. That is why we have raised this issue. For a pupil, even if he is ranked 10th in the district Math Olympiad, having a score of 8-9 points out of a total of 28 points is daunting and hard to understand that he is not a failure and that he must continue training for the following contests. In one of his motivational speeches, S. Ross said: "Here are some things about what is not a failure:

1. People believe that failure can be avoided. No, it cannot be avoided.
2. People think failure is an event. No, it is not.
3. People think that failure is the enemy, which is not true.
4. People think failure is irreversible. No, it is not.
5. People think failure is a stigma. No, it is not.
6. People believe that failure is final. No, it is not final." (Ross, 2016).

Based on these considerations, a new definition of failure is reached: failure is the price paid to progress, going forward in the middle of difficult situations, even when everybody else would think it was a failure. We believe that a lower (or even higher) secondary school student cannot easily overcome a "failure", so we suggest that the level of knowledge should be taken into consideration in the choice of topics, so that a hard-working student should be able to reach up to 14 points, leaving differentiation in the range of 15-28 points.

In order to make the learning process more active and creative, we believe that the “unique manual” must also include a sufficient number of counterexamples. This can create a learning environment encouraging discovery and can make a good delimitation of the conditions which are required for a student who is preparing for performance.

4. Conclusion

We believe that training for national exams can be done through the “unique manual” if it complies with many criteria, but the preparation of Olympic performance cannot be done only with its help.

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