



## ONGOING ANALYSES OF STUDENT ASSESSMENT DATA AS A MANAGEMENT TOOL IN EDUCATION

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### **Abstract:**

*D. Zupanc presented the method of the ongoing analyses of student assessment data - ALA Tool, where the analyses of achievements in national examinations with the summative assessment function are complemented with the formative function. Professional monitoring system provides schools confidential information on their performance and function as a basis for raising effectiveness and quality management. Student assessment should be closely related to the curriculum and based on the achieved standards. Based on the studies of the international knowledge measurement (PISA) it was established that curriculum-based external examination has a very positive effect on the quality of outcomes. The curriculum-based exist exams has a positive effect on the equity as well, as low SES students benefit more than high SES students. It was also established that upon the implementation of school autonomy by its staff the effects on the outcomes were positive. High(er) autonomy 'goes hand in hand' with high(er) accountability for the quality of work in schools. The ongoing analyses of student assessment data are a basis for professional discussions, analyses and interpretations, and, based on the gathered data and conclusions, for action-taking and improvements within the PDCA cyclic model as a quality management tool and effectiveness in education.*

*Keywords: Student assessment, Effectiveness, Ongoing analyses, Educational Management, Autonomy, Equity.*

## 1. DISTINCTIONS BETWEEN DIFFERENT DISTRIBUTIONS OF KNOWLEDGE MEASUREMENT

With the introduction of the general Matura exam, the partly external vocational Matura exam, and National Assessment (NA) at the end of three-year periods in primary schools, Slovenia introduced other methods of assessment (external exams) to its educational system, which are an addition to the internal teacher's assessment of knowledge. Thus, Slovenia was faced with a challenge of how to apply the results obtained in different knowledge measurements to exceed their usefulness as a mere certification tool at the end of a particular education level, and to efficiently use it for the upgrade of the educational management system.

To meet the “demands for achieving the internationally comparable knowledge standards of developed countries” (Bela knjiga..., 1995, p. 16), Slovenia took part in the international knowledge measurements, such as PISA and TIMSS. If knowledge assessment is understood as the measurement of achieved knowledge, a periodic “second” measurement system was thus implemented on a sample of schools in addition to the prevailing school (teacher's) internal knowledge assessment. With the introduction of the external Matura exam in upper secondary schools, the partly external vocational Matura in vocational schools, and the National Assessment at the end of primary school periods, Slovenia had set up another measurement system, which takes place every year in all schools in their classes, just like internal school (teacher's) assessment. Similarly as in natural and technical sciences, it is also true for knowledge measurement that systematic measurement errors cannot be detected without the use of various measurement systems. If only one measurement tool exists, one cannot determine whether the measured value is “correct”, too high or too low.

As Zupanc (2006b) established from statistical data, 30 years ago the overall achievement at the end of primary school in Slovenia was approximately 15 % of Excellent students (grade 5), somewhat more Very Good students (grade 4) – 25 %, many Good students (grade 3) – 35 %, 25 % of Sufficient students (grade 2), and some Insufficient students (grade 1) as well. In the overall achievement of the entire generation, 40 % of students were graded higher than Good (3), so the average grade of the overall achievement was a solid good (3.3). In the recent years, the distribution of grades in the overall achievement at the end of the eight-year primary school had already reached a point with practically no Insufficient grades and more than a quarter, i.e., 28 %, of Excellent ones. If the Very Good students are added to the Excellent share, more than a half of the population, i.e., 54 %, had finished primary school with an “above-average” achievement. The average grade in the overall achievement had come closer to the Very Good one (3.6). And what has been the grade distribution in the overall achievement after the introduction of the new nine-year primary school? The first official results for the entire population of peers (21,000) were published for the school year of 2003/04, when the first complete generation started the 7<sup>th</sup> grade of primary school. There were hardly any Sufficient students (4 %) and 37 % of Excellent students, while the sum of above-average, i.e., Excellent and Very Good, students was close to 70 percent – exactly 69.4 %. The average grade in the overall achievement has risen above Very Good (4).

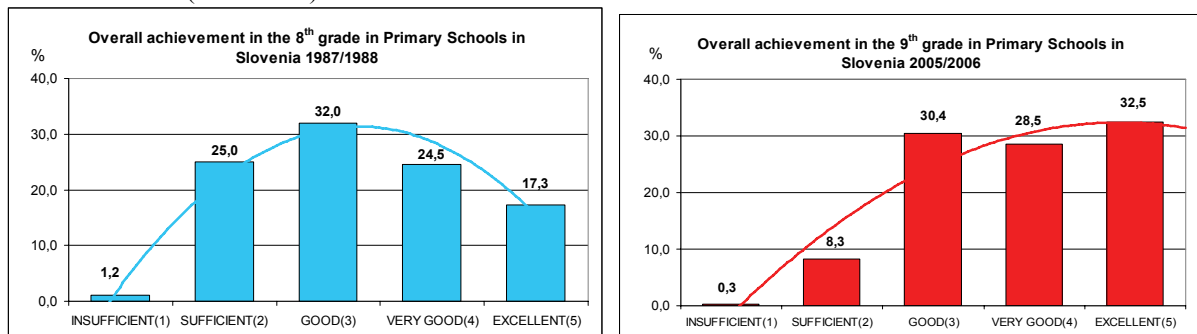
Picture 1 presents the distribution of the overall achievement in Slovenia at the end of primary school in the school year of 1987/88 and its distribution 18 years later (in 2005/06)<sup>1</sup> (Zupanc,

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<sup>1</sup> The new nine-year primary school enrolls six-year old children in the first grade. Therefore, the presented grade distributions at the end of 8<sup>th</sup> grade in 1987/88 and the end of 9<sup>th</sup> grade in 2005/06 relate to students of the same age.

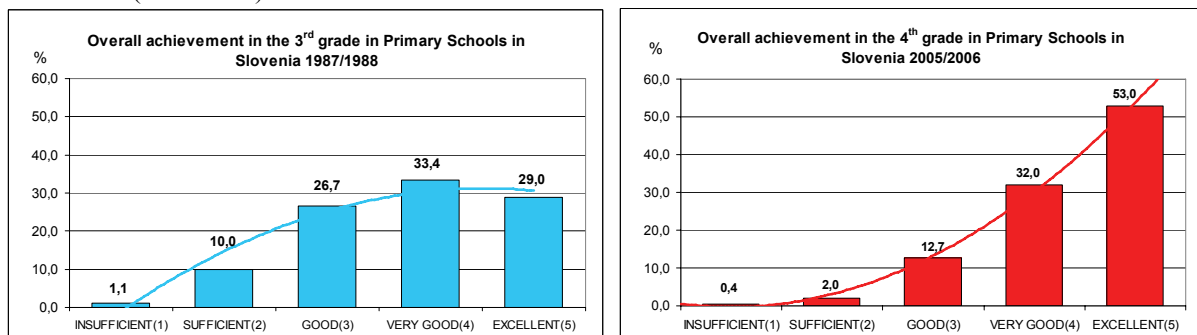
2010a). An even bigger discrepancy has occurred in the grade distribution of overall achievement on the lower level of primary school. In the 4<sup>th</sup> grade of the nine-year primary school, when numerical grading is used and the overall achievement was still determined, there were 85.0 % of above-average students (53.0 % Excellent and 32.0 % Very Good), 12.7 % of Good, and 2 % of Sufficient students in the school year of 2005/06. At that point, the entire generation had not yet attended the 4<sup>th</sup> grade of a nine-year primary school, but more than a half of the population had. Picture 2, left, shows the distribution of the overall achievement of peers (i.e., then attending 3<sup>rd</sup> grade) in the school year of 1987/88.

**Picture 1:** Overall achievement at the end of primary school education, school year 1987/1988 and 18 years later (2005/2006)



Source: Statistical Office of the Republic of Slovenia.

**Picture 2:** Overall achievement in the 3<sup>rd</sup> grade in the school year 1987/1988 and in the 4<sup>th</sup> grade 18 years later (2005/2006)



Source: Statistical Office of the Republic of Slovenia.

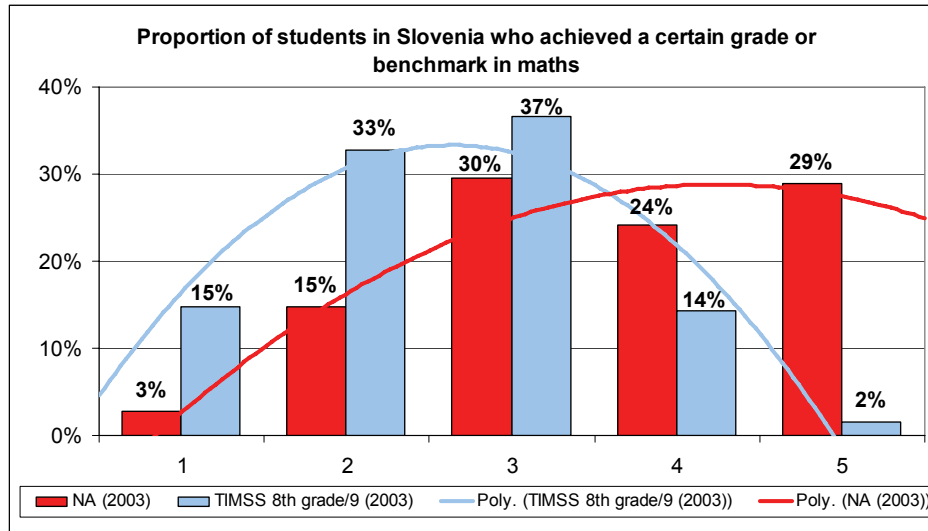
Zupanc (2005) compared the distributions of knowledge achievements on different grades or benchmarks at the National Assessment (NA) and the international TIMSS in different countries: Sweden, England, USA, Canada, and Australia. He did not recognize a discrepancy as striking as in Slovenia in any other country. A large part of students in 2003 did not even achieve the lowest benchmark in math (15 % of the 8<sup>th</sup> grade students in the nine-year primary school) and very few (2 %) achieved the high benchmark in TIMSS. The feedback that was obtained by students, parents, teachers, and other experts at the end of schooling with NA<sup>2</sup> reveals a discrepancy that calls for immediate disillusionment – picture 3.

The rates at which students failed to achieve or barely achieved the lowest benchmark at the national assessments (NA) were twice or even five times lower than the one measured by the TIMSS international assessment. More than half of the student population received above-average grades: Very Good and Excellent (53 % = 24 % + 29 %), with the percentage of

<sup>2</sup> The distribution of teachers' grades at the end of a school year is similar to the grade distribution at NAK.

Excellent grades being even higher than the percentage of Very Good ones. TIMSS, however, measured that at this age only a small percentage of Slovenian students achieved Advanced benchmark in math (Zupanc, 2005; Zupanc, 2010b).

**Picture 3:** Comparing distributions of maths grades in National Assessment (NA) in the 8<sup>th</sup> grade of nine-year primary school in Slovenia and achieved benchmarks in TIMSS (2003)



The ongoing analysis of the student assessment data enables the detection of eventual systematic errors. Such analyses can provide teachers with a starting point for corrections and improvements. Zupanc, Urank and Bren (2009) presented the applied method of the ongoing analysis of demonstrated knowledge where the analyses of achievements in national examinations with the summative assessment function are complemented with the formative function. It is important that the results of external knowledge assessment are primarily used for the demonstration of good practice examples and the recognition of weaknesses – with the intent of stimulating teachers and schools to improve the learning environment and raise the quality of teaching.

Such high discrepancies in the demonstrated achievements in the knowledge of Slovene students – in the multi-annual period shown in pictures 1 and 2, as well as compared to the international knowledge assessments shown in picture 3 – challenges researchers and practitioners to face the problems and seek appropriate solutions.

## 2. ONGOING ANALYSES OF STUDENT ASSESSMENT DATA AS A MANAGEMENT TOOL IN EDUCATION

### 2.1. School Performance Feedback System – SPFS

Professional monitoring systems and School Performance Feedback Systems (SPFSs) are in many countries defined as external information systems that provide schools with confidential information on their performance and function as a basis for self-evaluation. Development projects and applied solutions are known in the USA, Australia, Canada, and in Europe in the Netherlands, the Flemish part of Belgium, and England. The same reason lead to the development of the computer-based Assessment for/of Learning Analytic Tool – ALAT (Zupanc, Urank & Bren, 2009; Zupanc, 2011) in Slovenia. The developed instruments are intended for secondary school teachers, headmasters, and experts on the national level –

picture 4. The ALA Tool is used for the analyses of multi-annual results of students' achievements in external and school assessment, in order to determine the variability of those achievements.

Compared to other feedback systems used in the field of education, the Slovene Tool is extremely useful for teachers who can use it for the analysis of data on the classroom level. The school effectiveness studies emphasize the significance of the school level, while the classroom level is likewise important. In addition, teachers' work in classrooms where teaching and learning take place is very important as well (Zupanc, 2011). Within a particular school, the students' results on the national level can be above-average in a particular classroom, at a particular subject (teacher), while being below-average in another classroom, subject or teacher (Zupanc, Urank & Bren, 2009). The assumptions that students' achievements are almost entirely subject to their socioeconomic status (SES), as if schools and teachers did not play a role in creating important differences in their achievements (Coleman et al., 1966), are no longer true. Quality is a complex concept in the educational system and a single indicator that could be used to recognize and provide quality in that system does not exist. There are multiple indicators that establish quality on different levels of the educational system (Zupanc, 2006a). The ongoing analyses of student assessment data with the ALA Tool present the applied PDCA cyclic model, i.e., the Plan-Do-Check-Act process, for higher performance and quality in schools, and is used as a management tool.

**Picture 4:** Assessment for/of Learning Analytic Tool – ALAT: Selections in narrowing down the multitude of data, i.e. focusing on the (sub)group

Series	No cand.	No schools	Average	STD	Comments	Conditions description
1	2492	79	3,29	1,04		R=051; P=HIS; Š=ALL; N=1; MT=NO; 21L=NO; S=Students;
2	2822	80	3,05	1,00		R=061; P=HIS; Š=VSE; N=1; MT=NE; 21L=NE; S=Dijak;

### 3. AUTONOMY, ACCOUNTABILITY, KNOWLEDGE STANDARDS AND EQUITY

In modern organizational theories and in practice, professional autonomy and individual approaches are stimulated. In education, this implies more open curricula, school autonomy, professional autonomy of teachers and an individual approach in teaching and learning.

Prior to the legislative reform of the educational system in Slovenia, a comprehensive conceptual study was published – the *White Paper* (Bela knjiga..., 1995) – whose theoretical foundation *inter alia* state that 'the system of education is based on autonomy' (ibid, p. 15). The *White Paper* (ibid, 26–29) also indicated a link between the autonomy of schools and accountability. The autonomy 'goes hand in hand' with the responsibility for the quality of work in schools (Koren, 2007). The 'demands for reaching internationally comparable standards of knowledge of developed countries' (Bela knjiga..., p. 16) are also important. In its desire for reaching internationally comparable standards of knowledge of developed countries (ibid, p. 16), Slovenia took part in the international measurements of knowledge TIMSS, PISA and PIRLS.

The principle of teachers and schools being autonomous in their work is necessarily connected with the inclusion of learning objectives in the educational activity plans and the testing of achievements based on knowledge standards. The knowledge standards should be defined in curricular documents. Looney (2009) stresses that knowledge assessment should be closely related to the curriculum and based on the achieved standards of knowledge. This is very important in Slovenia because in the recent years, endeavors within legislative changes in the education that diverge from the standards of knowledge have been stalled. Without the knowledge standards at the end of schooling and at enrolling to higher levels of education, the empty fields in decision making may be filled by unreliable criteria that are not objectively measurable. That, however, is unfair to the participants in the education and further deepens the social inequality (Wößmann et al., 2007; Schütz et al., 2007).

Based on the data obtained from international knowledge measurements (PISA 2000 and PISA 2003) and in accordance with the findings from the PISA 2006 study, the OECD (Organization for Economic Co-operation and Development) experts summarized the findings on accountability in educational systems, on the quality of outcomes, and on the equity thereof (Wößmann et al., 2007; Schütz et al., 2007). The *White Paper* of 1995 mentions the relatedness between "the schools' autonomy and the control over the quality of school work" (Bela knjiga..., 1995, p. 26–29) It should be emphasized that this is a "package" made up of two components: high(er) autonomy 'goes hand in hand' with high(er) accountability for the quality of work in schools. Stringfield et al. (1997) stated that the autonomy of schools and teachers alone does not lead to higher effectiveness of the educational system and that studies do not show relatedness with students' outcomes. Based on the secondary studies of the international knowledge measurement (PISA) it was established that upon the implementation of school autonomy by its staff (i.e., teachers and other professional staff in school) the effects on the outcomes were positive, but rather negative as far as equity was regarded: high SES students benefited more than low SES students – table 1.

**Table 1:** Summary of results about testing school autonomy: Relation between system level features and schooling outcomes: Accountability Features, Quality of Outcomes and Equity of Outcomes

<b>Accountability Features</b>	<b>Quality of Outcomes</b>	<b>Equity of Outcomes</b>
<b><i>School Autonomy</i></b>		
Autonomy over staffing	Positive	Negative
Autonomy over budgets	Negative	No effect.
Autonomy over curriculum	Makes no difference in absence of curriculum-based external exams.	Positive in presence of curriculum-based external exams.
Interaction between autonomy and testing (external exit exams)	Autonomy over budget turns positive in presence of testing	

Source: Wößmann et al., 2007; Schütz et al., 2007.

When taking a look at school autonomy over its finance resources, negative effects on the outcomes were determined, while it had no influence on the equity. The school autonomy over the curriculum showed no difference in the outcomes, except when curriculum-based external exit exams were introduced to the system. In that case, the contribution to equity was positive – better for the low SES students. When external exit exams are introduced in the educational system, the school autonomy over budgets also has a positive effect on the knowledge outcomes.

Table 2 (Wößmann et al., 2007; Schütz et al., 2007) shows that curriculum-based external examination has a very positive effect on the quality of outcomes. All students benefit from such an arrangement, albeit those with high SES somewhat more. The effects are positive, if assessment-based decision making is used for the promotion and retention of students – this is neutral for the students and all SES students benefit to the same extent. The effects are positive in the monitoring of teachers: all students benefit, somewhat more the ones with high SES. The effects are also positive when applying testing results to determine the benchmarks in comparison to other schools and on the national level. As far as equity is regarded, the outcome is neutral and all SES categories benefit equally. Regular standardized testing has a positive effect on the achievements when related with exit exams, otherwise not. The effect on equity is neutral. Teachers’ assessment has a slightly positive effect on achievements, while the low SES students benefit more from it. The use of assessment for the formation of student groups according to their ability and performance has a negative effect on quality, while the effect on equity is neutral and all SES categories benefit the same.

**Table 2:** Summary of results about testing: Relation between system level features and schooling outcomes: Accountability Features, Quality of Outcomes and Equity of Outcomes

<b>Accountability Features</b>	<b>Quality of Outcomes</b>	<b>Equity of Outcomes</b>
<b><i>Testing/Inspection</i></b>		
Curriculum-based external exit exams	Strongly positive	Benefits low SES students, but benefits high SES more.
Use of assessments for decisions about retention and promotion	Strongly positive	Neutral; benefits low SES students in the same way it benefits high SES students.
Use of assessment for grouping students by ability and performance	Negative	Neutral; benefits low SES students in the same way it benefits high SES students.
Monitoring of teachers by school heads/senior teachers	Positive	Benefits low SES students, but benefits high SES more.
Regular standardized testing	Positive in the	Neutral.

	presence of exit exams; negative otherwise	
Subjective assessment by teachers	Slightly positive	Benefits low SES students more than it benefits high SES students.
Benchmarking of school performance against that of other schools, district and/or national performance	Positive	Neutral; benefits low SES students in the same way it benefits high SES students.

Source: Wößmann et al., 2007; Schütz et al., 2007.

The results in schools can be better, if analyses are carried out within individual schools to highlight the gathered data in detail, while their interpretation can help direct agents (head teachers, teachers and students) to achieve changes. Looney (2009) stresses that a monitoring system has to be implemented in schools in order to manage improvements. A monitoring system is the condition for the modernization of an educational system based on standards. If countries set high performance standards and maintain the accountability of schools for reaching those standards by the monitoring of achievements, the teachers and schools will change their activities towards better student achievement. The emphasis is put on the monitoring of students' achievements and not on the monitoring of school process which can differ between schools and between teachers due to their autonomy.

#### 4. DISCUSSION

The ongoing analyses of student assessment data with the ALA Tool can be related to the discussion on the findings from the OECD studies on the testing as a form of accountability in the educational system, and on the quality and equity of outcomes – table 2. The ALA Tool is based on the data on teachers' grades and the curriculum-based exit exams, which according to OECD studies (Wößmann et al., 2007; Schütz et al., 2007) has a strongly positive effect on the quality of outcomes and the equity, as low SES students benefit more than high SES students. The ongoing analyses of student assessment data with the ALA tool enable the analyses of decision making regarding the students' promotion, and can handle the achievements of insufficient and failing students separately, which according to the OECD studies (ibid) also has a strongly positive effect on the quality of outcomes. As far as the equity of outcomes is concerned, the effect is neutral, as both low and high SES students benefit the same (ibid). The ongoing analyses of student assessment data are basically intended for the monitoring of the results of teacher's instruction in the PDCA cyclic process, for the self-evaluation of teachers' and schools' work, and also for external evaluation, which according to the OECD studies (ibid) has a very positive effect on the quality of outcomes. Regarding the equity between low and high SES students, the latter benefit more (ibid). The data also incorporate internal school (teacher's) assessment that is based on curriculum, which has a slightly positive effect on the quality of outcomes (ibid) and a positive effect on the equity, as low SES students benefit more than high SES students (ibid). The ongoing analyses of student assessment data with the ALA Tool enable the setting of benchmarks which can be applied as a tool in setting performance standards. According to the OECD studies (ibid) the determining of benchmarks also has a positive effect on the quality of outcomes, while regarding the equity of outcomes the influence is neutral, as both low and high SES students benefit from it (ibid). Variability analyses that are carried out with respect to the benchmarks of other classrooms within a school, in other schools and on the national level, are the basis



for evaluation, recognition of trends, discussions on possible causes and looking for improvements, higher performance and quality management in the educational system.

Variability in students' outcomes can be detected on all levels of the schooling system: between different student groups, between classes within a school, between different teachers of the same subject within a school, between different subjects in a school, between related schools, between different educational programs, etc. High, significant and constant variabilities in outcomes which are measured and presented on different levels (in the overall achievement, in achievements in different subjects, in longitudinal studies, according to different student structures, etc.) cannot be explained by blaming it on random errors, as they point to systematic reasons. The causes can be looked for in a schooling system, on the level of educational programs, within a school, in a specific subject, in a subject group, in a particular teacher, in a specific group of students, and in individual students. Such information are a basis for professional discussions, analyses and interpretations, and, based on the gathered data and conclusions, for action-taking and improvements within the PDCA cyclic model of quality management. Examples of good practice and excellence as well as weaknesses have to be identified, which in the PDCA cyclic process enables data-based decision making and the implementation of well-thought improvements, contributing to a more effective system on each and every level of education. If the majority of teachers drew their students' outcomes closer to the outcomes of their colleagues who have better or the best results in a school, significant progress in effectiveness would be made in schools and, consequentially, in the entire educational system.

The limitations of the study are that student assessment data in Slovene ALA Tool does not measure student outcomes beyond the cognitive domain of learning: affective, psychomotor, and metacognitive. There's no information about students' background characteristics: SES, ethnicity, language spoken at home etc. The key challenge for further research in the field should lead to special studies which will be concerned with the impact on students' cognitive and non-cognitive outcomes produced by sociocultural and economics factors. Consequently different groups need differentiation in teaching, in classroom and also in school management.

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