TRACKING, EVALUATION, AND GRADING STUDENT'S ACCOMPLISHMENT IN MATHEMATICS CLASESS

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ABSTRACT

This work will emphasise tracking, evaluation, and grading student's accomplishments in mathematics classes. It is not enough just to track and grade acquiring knowledge, skills and habits, but it is also necessary to evaluate development of attitude, reasoning, subjective and objective development possibilities for students to become versatile, happy and human personalities. One of the hardest tasks in mathematics classes is evaluation of students. It is very complex process, but also it is the only possibility for teacher to acquire system for evaluation, tracking and grading students. System for evaluation must be in coordination with existing school system.
Keywords: tracking, evaluation, grading, knowledge, skills, attitude, reasoning, interest, development, student, system, recording

INTRODUCTION

Tracking, evaluation, and grading, are very complex processes that require skill and knowledge to be implemented. That is the reason why this issue was dealt with early in the history. Diagnostic value of grades was questioned. School practice shows that students and their parents are often dissatisfied with grades. Society criticised grades that often did not match with knowledge that the grade represented. All that lead to conclusion that there was something wrong with traditional grading system - grades were not valid representation of knowledge, nor prediction for success in social affairs, that students are studying for.

Based on the grading procedure in Bosnia and Herzegovina, following problems were found: teachers that are not familiar with grading issue, that could be used in schools, rules and criteria do not exist, teachers use their own methods, grading is in form of numeric values, but other grading results, such as reports of student's development, are scarce, grading is not equally distributed during the school year. At the end of the educational cycles evaluation activities frequency is higher, putting students under more pressure, grading is not transparent enough, and grades are not followed with explanation about student's accomplishment, grades in some subjects are very low, and vary from school to school, conflicts in schools are most often result of poor grading, some teachers use grades as means to attain discipline in classroom, instead of motivation for students (Arambašić, 2005).

Reform of education, that is being conducted in schools in Bosnia and Herzegovina, is also one of the reasons of our engagement in search for the causes of poor assessment. Many teachers are not yet familiar with work methodologies, and if they are, the are not sure how to implement them. They encounter many concerns, that they can not handle successfully.

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THEORETICAL BASIS

Baselines in tracking students

Teacher's vocation is of an immense importance in tracking student's progress, and accomplishments in mathematical classes, that are part of nine - year elementary school, that is a part of educational process. Docimology is the science of tracking, evaluation, and grading student's accomplishments. Docimology is, therefore, the science of grading in school (greek Docimos - testing, Logy - science). Components of docimology are internal and external evaluation. External evaluation implies subject's grades outside of school, or values of certain school (Matijević, 2002). Internal evaluation implies tracking, grading and guidance, namely pedagogical guidance. When we talk about tracking we have to bear in mind that tracking implies cognitive, experiential, and psychomotor aspect of education, and biological, social, and self-actualising aspect of upbringing.

Tracking implies elaborated system consisting of procedures, techniques and instruments for determining flow of development and certain pedagogical vocation usefulness degree in educational institutions. Tracking gives an insight in student's learning and work style, considering classes, extracurricular activities, studying at home etc. There are many techniques, used for tracking student activities and results, from monitoring to written or nonwritten results recording, forming collections of student work (portfolio), that can be used for analysing work of students, parents, teachers, and professional orientation experts collectively (Rešić, 2013).

Student tracking and grading should be done in following manner: student's personality is recognised and respected, student's self esteem and progress is encouraged, active participation in classes is also encouraged, students can request examination, students are prepared for self-learning, self-evaluation and evaluation of other students from their class (Rešić, 2013).

Informal tracking methods such as monitoring, keeping records of important notes and student work portfolio are used in current knowledge evaluation, and developing strategies for further progress.

Portfolio (student work map)

Portfolio is the final result of tracking, and evidence of whole tracking procedure. Portfolio is a collection of student work that are used for documenting student progress in certain period of time (Rešić, 2013). Collecting student work is proven useful in pedagogical practice. This technique is irreplaceable in schools all around the world, and one of the most important indicator of student activities and progress.In the beginning of school year, students and teachers should make an agreement on the manner of collecting, and preserving student's work, for it to represent the evidence of student's activities, and progress. That way, more thorough insight in student abilities, and flaws would be acquired. Portfolio emphasises student individuality, helps with student pedagogical guidance, and forming report card at the end of the year.

Portfolio should contain:

1. Documentation about student's initial knowledge, school enrollment, medical records etc.
2. Interview with parents considering social card of their child, its interests, habits, needs, social circumstances, parents education, number of household members,
3. Student work collected in certain period of time, organised by subjects. Work for the portfolio is selected by teacher. Selected work should indicate state of student's progress in a given moment comparing to previous period (Rešić, 2013).

Evaluation of students – term

Evaluation as organisational and planning activity is almost as old as school itself. Evaluating represents different operation than measuring. With development of society and emphasised differentiation of human experience, and it's transfer to younger generations, more organised and better planned training of youth was needed, and with all that, value of evaluation, as immanent follower of educational system rose. Need for broader comprehension of work evaluation came with broader areas of practice. Evaluation represents systematic data collecting in learning process and raised levels of competences: vocations, skills, abilities, independently and responsibly performing duties, in accordance with predefined and accepted methods, procedures and elements. Evaluation encourages and intensifies essential changes in work, that are included in evaluation system, and it is important precondition of positive work processes in school.

Positive features of evaluation are: it provides control control over education and upbringing process; intensifies whole learning activities in school and provides evaluation of all tipes and areas of work conducted in school; it encourages teachers and students to work better (Fennema and Sherman 1976.).

Grading student work and achievements

Grading is one of the hardest and most important obligation of teachers.

What is grading? Grading represents measurement of knowledge. Unit for measurement of knowledge is not clearly defined, and therefore can not be precisely explained. When we talk about grading it is necessary to mention dichotomous grading scale in where are only two grades. That kind of grading is present in entrance exams, where student is accepted or not, or job try-outs etc.

When it comes to school grading scale, it has five grades. Distribution is not normed so that student graded with "very good (4)", has twice as much knowledge as student graded with "enough (2)". That type of grading can not be fully objective.

Teacher's subjectivity is often questioned when it comes to grading. It is considered that the teacher, during the vocal examination, always has a dose of subjectivity. Therefore, the question is - can the teacher refrain from subjectivity regarding grading written exams. If distribution of exam results is normal, assignment correctly solved, by the majority of students, constitutes an average assignment. That means that majority of the students solved at least two thirds of the assignment. They are graded with "good (3)". Fewer students are graded with "very good (4)" and "enough (2)", and extreme cases - the students graded with "excellent (5)" are the minority. This type of grading is known in literature as grading that uses statistical criteria. It is applicable if distribution of the exam results is normal. This results, with significantly worse objective circumstances, in normal distribution in the middle, but every grade in that distribution will produce slightly poorer knowledge reflecting in lesser assignments correctly solved for every grade. This grading method is correct according to the student. However, this way, the grade lost its objective knowledge measure component. For instance, for the same number of correctly solved assignments in written exam, student is graded differently. Even students, if they had an insight in this method of grading, would consider it as unfair (Pavleković, 2008).

Teachers today, usually get prepared exam assignments, where students can see maximum points per assignment, and can conclude how many points they need for certain grade. This method of examination, allows student to participate in grading process, and therefore is more objective.

Characteristics of the grade

For a grade to express real student's achievement in mathematical classes it has to be: valid, objective and reliable. Validity is reflected in a degree of mathematical program mastery in accordance with the operative class assignments. Objectivity indicates grading dependence on the results, and not on teacher's subjective impressions, or nature of the instrument. Reliability means that for the same degree of mathematical program mastered, students are graded equally by all teachers. Teacher should also take in consideration student's personality, living and working conditions, abilities, stress, commitment etc. Work and results grading in classes of mathematics, is done by numerical and descriptive value. Main component of the grade is level, extent and quality of knowledge (Pinter, Petrovic, Sotirovic, & Lipovac, 1996).

Self evaluation

Didactic rules are that every leading should become independent leading, every teaching self-learning, every management independent management, and evaluation self-evaluation. Teaching process in schools should be viewed as students and teachers working together. That work consists of many complex processes, and for it to be systematic and purposeful, it requires planning. Teacher should plan his class curriculum implementation for every month, week and day.Students should be included in that planning, from first days of obligatory education, according to age development of certain student category. First days of school, teacher use to make groundrules about behaviour, ways and places for studying. At the end of each day all that has been done is analysed. Students are asked about their impressions, and expected to share ideas about possible changes and improvements. Day in school usually starts with a conversation. Students will accomplish some goals with individual effort, and some with cooperation with one or more other students. At the end of the day students discuss their results. Teacher's style can help in empowering students for tracking their own activities and for self-evaluation. That empowerment begins in first days of obligatory education, and first days of collective work, and it lasts for life. Self-evaluation helps students to develop appropriate self-criticism.

Descriptive grading in nine-year elementary school
Following good pedagogical practice in Europe and world, Bosnia and Herzegovina has implemented obligatory nine - year elementary education. Change in educational system represents an opportunity for modernisation, and improvement of quality of schools, as well as elimination of defects. With this reform came descriptive grading. This grading method is used in schools by the third grade. Descriptive grading puts every student on a certain level on value scale, according to quality and quantity of student's knowledge, skills, habits, commitment, activity in class, interest in learning, reasoning ability etc. With descriptive grade, we try to express knowledge and abilities that student has acquired, knowledge and abilities that student should have acquired, but didn't, acquired skills, conditions in wich certain knowledge and abilities were acquired, effort needed, interest and attention shown in classes, and whole student's attitude throughout the school year.

Problem definition and significance

Tracking, evaluation, and grading student's accomplishments in mathematical classes is very complex process and requires a lot of knowledge and skill to be implemented. This problem is probably couple of decades old, and many researchers attempted to solve it. The fact that grading in that time had many defects, forces the researchers to deal with this problem. Those shortcomings were pointed out by students, their parents, and society in general. Many comments about grades not representing adequate knowledge, could be found in society back then. All that suggested disharmony between the grades and student's knowledge and equivalent preparation for further education. When it comes to Bosnia and Herzegovina, current problems are related with: lack of knowledge about issues related to grading, every teacher has his/her own grading methods, because there is no criteria for them to hold to, evaluation and grading are not continuous throughout the year, and it is more intense in the end of the semester and at the end of the school year, wich results in putting students under unnecessary pressure, grading is not transparent, very low grades in some subjects, without explanation.
Problems listed above, often cause conflicts between students and teachers. Some teachers use grades as an instrument for attaining discipline in the class, and that should never happen. Topic of this research is tracking, evaluation and grading in nine-year elemen-

tary school. Reform that took place in Bosnia and Herzegovina, brought with it new demands. Reform gave schools completely new role, but note that reform is very variable, and advancing category.
Considering that every change requires new grading and evaluation methods, new method has been introduced - so called descriptive grading. With this method, student gets a grade, explanation for it, and guidelines for further learning, wich means that grading process is not finished with just getting a grade. For teacher, to lead student to more effective learning, it is necessary to get feedback from the student, and grade the student according to it. For teachers to accomplish remarkable results, it is necessary to search for new evaluation methods constantly, to include all of the student's abilities into account when giving a grade. All that could be a good indicator for student's future profession. For all that to be accomplished, competent teacher, and diligent student are needed.
Topic of this research implies: inquiring teachers opinion on grading methods, determine wich methods teachers use, determine reasons why teachers use those methods (numerical or descriptive), inquiring if teachers are evaluating and grading continuously throughout the school year, determine what grading method teachers prefer (numerical or descriptive), and wich one of those they consider having larger motivational value, if teachers consider that descriptive method has larger motivational value, they should specify benefits of that grading method.

Research goal
Goal of this research is to critically analyse, and interpret students and teachers position on descriptive and numerical grading, and student's achievements and work.

Research tasks
Tasks of this research are to:
  - determine if knowledge is the most important component of evaluation in mathematical classes;
  - determine what grading method teachers prefer (numerical or descriptive);
  - determine if descriptive grading is prefered by students, and if it is in accordance with educational reform in Bosnia and Herzegovina;
  - determine wich method has larger motivational value (numerical or descriptive);
  - interpret what grading method teachers use more often and why.

Main hypothesis

Teachers have positive experience with descriptive grading, that is aside to numerical method, increasingly used in educational system.

Population and specimen

Population in this research was consisted of elementary school students in town of Banovići. Research was conducted in september 2013., in "Seona" elementary school in Aljkovići, "Grivice" elementary school, and "Banovići" elementary school in Banovići.

The survey was conducted on a sample of 50 teachers and 240 students (2nd and 3rd grade - 120 students, and 4th and 5th grade - 120 students).

Students were selected randomly. Participating schools were from town Banovici as well as from country side.

Research methods

Methods used to conduct this research were: theoretical analysis, descriptive method and survey method.

Research techniques

Survey technique was used in this research, and with this technique data for tracking, evaluation and grading student's achievements in mathematical classes was attained.

Statistical data processing involved reviewing survey questionnaires, and entering data into the table.

Research instruments

Within research technique there are certain tools ie. research instruments used for identification, collecting, and measuring scientific facts.

For needs of this research following instruments were constructed: questionnaire for 4th and 5th grade students and questionnaire for teachers.

Research organisation and research flow

Research about tracking, evaluation and grading students in mathematical classes was conducted in 2013/2014 school year, in the period between 16.9.2013 and 27.9.2013.

Visit to schools, and conversations with directors, pedagogues, and teachers was conducted first, and there survey realisation was agreed. Students took the survey during one class, and teachers took the survey during teachers assembly session.

ANALYSIS AND INTERPRETATION OF THE RESULTS

ATTITUDES OF 4TH AND 5TH GRADE STUDENTS OF NINE-YEAR ELEMENTARY SCHOOL TOWARDS TRACKING, EVALUATION, AND GRADING THEIR ACHIEVEMENTS IN MATHEMATICAL CLASSES

Second group of questions examine attitude of 4th and 5th grade students of nine-year school towards tracking, evaluation and grading their achievements in mathematical classes.

1. I like numerical method of grading my knowledge

What we attempted to find out with this first question is whether students liked numerical method of grading knowledge, or not. The answers were as following:

From total 120 students, 98 (81,66%) of them stated that they like numerical method of grading their knowledge, only 2 (1,67 %) of them stated that they don't , and 20 (16,67 %) of them said that they like numerical method of grading occasionally.
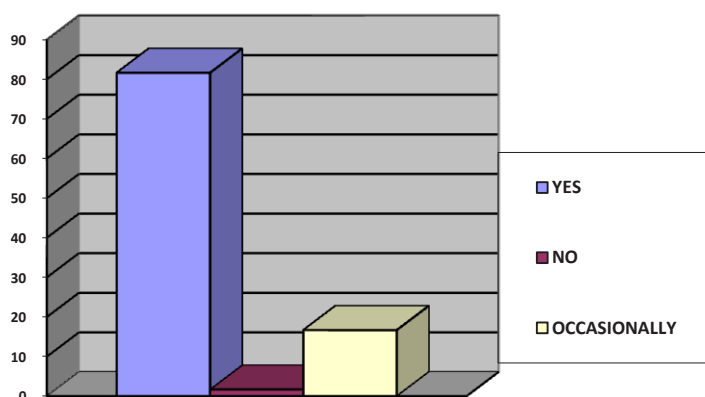

Analysing answers to the first question revealed that even 81,66% of the students stated that they liked numerical method of grading, 1,67% stated that they didn't, and 16,67% stated that they liked it occasionally.

2. I prefered descriptive grading method to numerical grading method.

The answers to this statement were as following:
From total 120 students, 20 (16,66%) of them stated

that they would prefer descriptive grading method to numerical, 82 (68,34%) stated that they wouldn't, and 18 (15%) of them stated that they would prefer descriptive grading method to numerical occasionally.
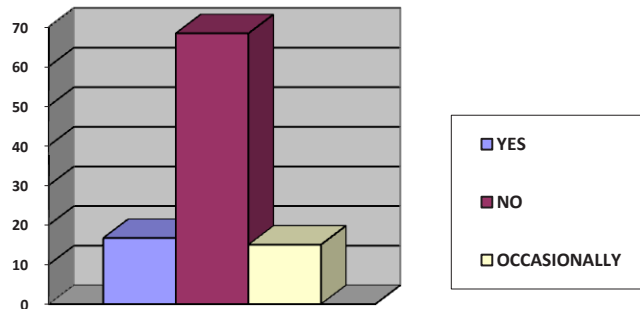
As shown in chart vast majority even 68,34% of the students did not prefer descriptive method of grading, while only 16,66% did, and 15% of students stated that they would prefer descriptive grading method occasionally.

3. My knowledge is often tested in written and verbal form

Answer analysis revealed:
From total 120 students, 82 (68,34%) of them confirmed that teachers often test their knowledge, 6 (5%) of them did not confirm that, and 18 (26,66%) of them stated that teachers do that occasionally.
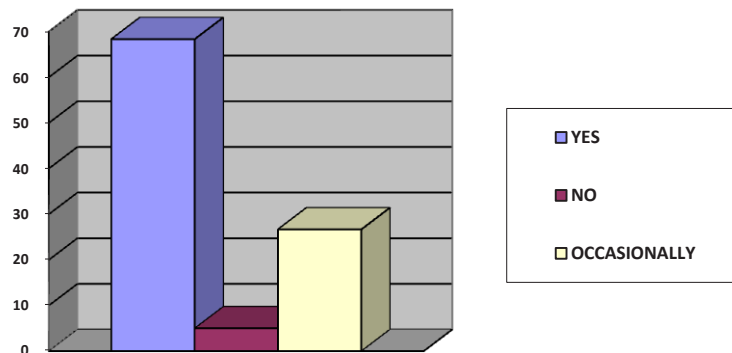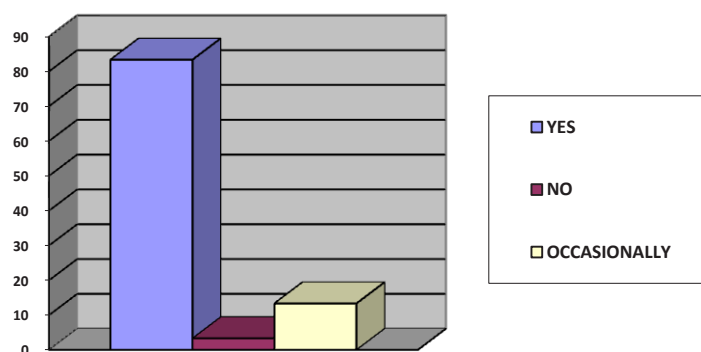

From the chart above, we can state that majority of the students, 68,34% of them confirmed that teachers often test their knowledge, 5% of them did not confirm that, and 26,66% of them stated that teachers do that occasionally.

3. I regularly add all of my work to portfolio
Portfolio, or map of student's work is the end result of

our tracking, and represents proof of whole tracking process.

To this statement, students gave following answers:
From total 120 students, 100 (83,34%) of them stated that they regularly add their work to portfolio, 4 (3,33%) of them stated that they do not regularly add their work to portfoliol, and 16 (13,33%) of them stated that they add their work to portfolio occasionally.

From the chart above, we can state that vast majority of students regularly add their work to portfolio, 3,33% of them do not do that regularly, and 13,33% of the students do that occasionally.

ATTITUDES AND OPINIONS OF THE TEACHERS REGARDING TRACKING, EVALUATION AND GRADING STUDENT'S ACHIEVEMENTS IN MATHEMATICAL CLASSES

Third group of questions examine attitude of the teacher in nine-year school towards tracking, evaluation and grading student's achievements in mathematical classes.
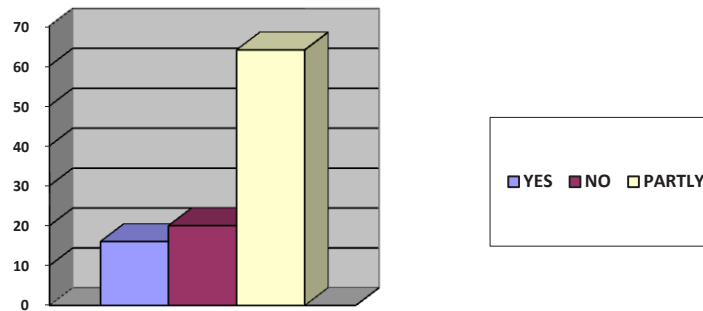
1. Descriptive grading method suits modern upbringing and education the best

We attempted to determine if descriptive grading method is the best method for modern educational system.
The answers to this statement were as following:
From total 50 respondents, only 8 (16%) of them responded positively to the statement above, 10 (20%) of the respondents do not agree with this statement, and 32 (64%) of the respondents thinks that descriptive grading method partly suits modern upbringing and education.

From the chart above, we conclude that teachers consider that descriptive method of grading only partly fits modern educational system, 16% of them think that it does fit modern educational system and 20% respondents think that it does not.
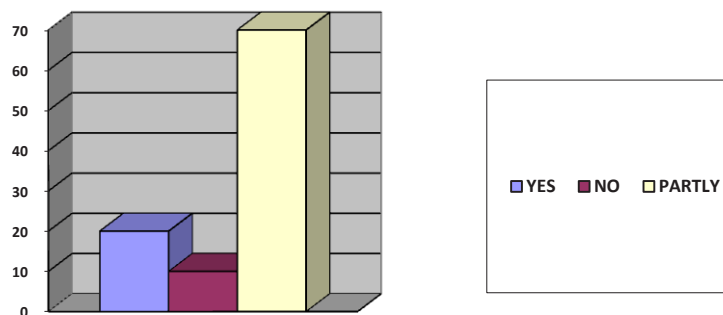
2. Descriptive grading method can determine student's level of knowledge acquisition

The answers to this statement were as following:
From total 50 respondents, 10 (20%) of them answered with YES, only 5 (10%) answered with NO, and majority of the respondents 35 (70%) considers that descriptive knowledge can partly determine student's level of knowledge acquisition.


The chart above clearly shows that majority of the teachers, 70% of them think that descriptive grading method can only partly determine student's level of knowledge acquisition, while 20% of the teachers think that descriptive grading method can completely determine student's level of knowledge acquisition, and 10% of the respondents stated that descriptive grading method can not determine student's level of knowledge acquisition at all.

3. Numerical grading method should be implemented earlier, from the second grade

From total 50 respondents, 41 (82%) of them answered with YES, only 5 (10%) answered with NO, and 4 (8%) said MAYBE.
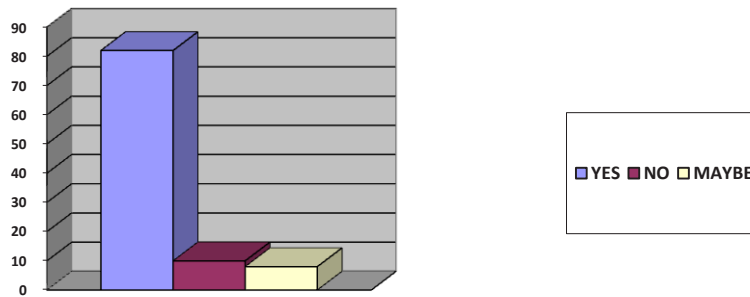
Analysing the responses we came to the conclusion that vast majority of the respondents, 82% of them, agrees with the statement above, 10% of the respondents do not agree that numerical grading should be implemented earlier, and 8% of the respondents are indecisive.

4. Student's work map (portfolio) should be the basic instrument for tracking, evaluation and grading process of student's achievements in mathematical classes.

Should the portfolio be used as the basic instrument for tracking, evaluation and grading process of student's achievements, teachers responded as following: From total 50 respondents, 10 (20%) of them answered with YES, 10 (20%) of them answered with NO, and 30 (60%) answered with MAYBE.
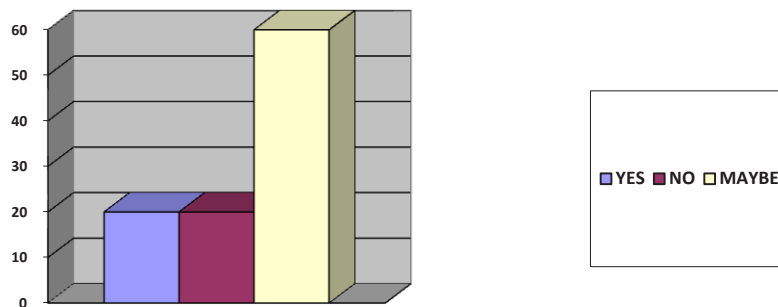
Analysing the responses we came to the conclusion that majority of the respondents, 60% of them were indecisive, 20% of the respondents do not agree that numerical grading should be implemented earlier, and 20% of the respondents agree with the statement above.

5. Numerical grade in the first third would have larger motivational value than descriptive grade

Attitude of the teachers towards this issue was clear. All 50 teachers (100%) consider that numerical grade in the first third would have larger motivational value than descriptive grade.
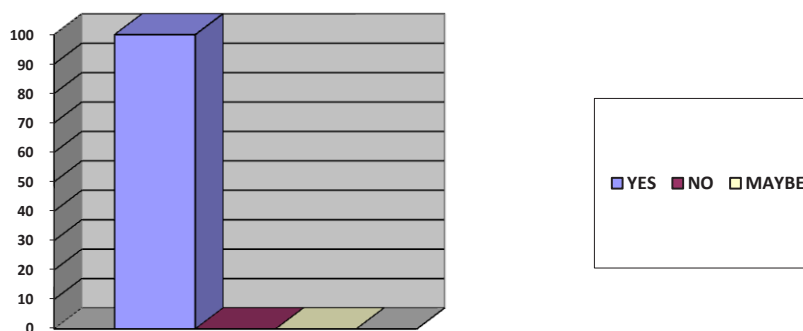
All of the teachers 100% of them, are convinced that numerical grade in the first third would have larger motivational value than descriptive grade.
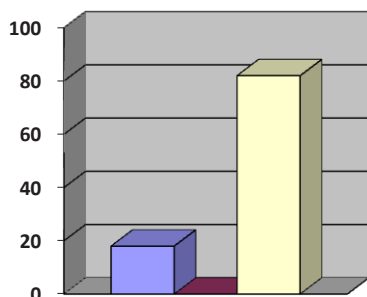
6. I use written examination more often than verbal examination in mathematical classes.
From total 50 respondents, 9 (18%) of them answered with YES, none of the teachers said NO, and 41 (82%) answered that they use both types of examination equally.
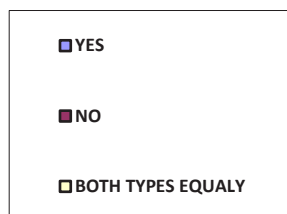
Analysing the responses we came to the conclusion that vast majority of the respondents, 82% of them stated that they use both types of examination equally, 18% of the respondents stated that they use written examination method more often, while none of the teachers used verbal examination more often.

7. Write down your opinion on using descriptive grading method in the process of tracking, evaluation and grading of student's achievements in mathematical classes.
To this question, respondents gave some of the following answers:
  - descriptive grading method is not efficient grading method for our teaching conditions, and for it to be objective more time, funds, and equipment.
  - benefit of descriptive grading method is that students are less exposed to stress and pressure, and it's flaw is lack of motivation for students.
  - descriptive grading method is efficient and gives a broader insight in student's abilities, but only in combination with numerical grading method, because without it, it doesn't provide students with needed motivation
  - descriptive grading method should only be used in 1st grade.
  - descriptive grading method takes away much of the teacher's time, that could be used for work with students directly.

8. Write down your recommendation for more efficient method of tracking, evaluation, and grading student's achievements in mathematical classes
  - numerical grading method should be implemented from 2nd grade, because it would provide more motivation for students.

  - reduce curriculum quantity.
  - more education and support for teachers
  - improve financial support for schools in order to achieve more success with students.
  - reduce administrative and documentation work during the tracking process in order to focus students and not the paperwork.

CONCLUSION

Many teachers still use traditional grading methods, so they value knowledge as most important component for grading, neglecting other student's abilities. If we look into the state of modern education, we can draw a conclusion that value of traditional grading method is decreasing. Reason for this is that teacher assess many other factors except knowledge, such as: student's behaviour outside of school, participation in extracurricular activities, relationships with other students, parents etc., and all that means that teachers not only grade students, but they evaluate them. According to this research, data analysis and facts we obtained in this work, we can conclude that teachers partly consider descriptive grading method as fit for modern education and upbringing. Teachers want to keep up with european teachers, and are ready to accept changes that come with modern education. Since descriptive grading method is relatively new term in elementary education, teachers concern is understandable, as well as their insecurity if they are implementing it correctly.Despite all the above, descriptive grading method is increasingly present in educational system in Bosnia and Herzegovina. Teachers, as it is shown in this research, do not value one method over the other, but they use both of the methods when they feel that would be purposeful.

Students, on the other hand, as shown in practice, are more motivated by numerical grading method.

Looking back at statement that numerical grading method should be implemented earlier, from the second grade

From total 50 respondents, 41 (82%) of them answered with YES, only 5 (10%) answered with NO, and 4 (8%) said MAYBE.

Analysing the responses we came to the conclusion that vast majority of the respondents, 82% of them, agrees with the statement above, 10% of the respondents do not agree that numerical grading should be implemented earlier, and 8% of the respondents are indecisive. From all the above, we can conclude that teachers do not favour descriptive grading method, and with that conclusion we could not confirm second sub hypothesis of this work. Does descriptive grading method suits modern education and upbringing system?

The answers to this statement were as following:

From total 50 teachers, only 8 (16%) of them responded positively to the statement above, 10 (20%) of the respondents do not agree with this statement, and 32 (64%) of the respondents think that descriptive grading method partly suits modern upbringing and education.

We can conclude that majority of the teachers consider that descriptive method of grading only partly fits modern educational system, 16% of them think that it does fit modern educational system and 20% respondents think that it does not. Taking this into account it is clear that we did not confirm third sub hypothesis of the work. Descriptive grading method provides objective insight in student's knowledge. Beside descriptive grade, teachers think that numerical grade could have larger motivational value in the first third of the school year. Attitude of the teachers towards this issue was clear.

All 50 teachers (100%) consider that numerical grade in the first third would have larger motivational value than descriptive grade. All of the teachers 100% of them, are convinced that numerical grade in the first third would have larger motivational value than descriptive grade.

It is necessary for teachers to focus their attention to grading student's work, to take advantage of their creativity in preparation, examination and grading students. That way, they will have an objective image about student's work, make more objective decisions when grading students, and accomplish better results in shaping student's personality.

From teachers opinions regarding written and verbal examination we can conclude that they use both types of examination, and that confirms our 5th sub hypothesis of this work.

From total 50 respondents, 9 (18%) of them answered with YES, none of the teachers said NO, and 41 (82%) answered that they use both types of examination equally.

Analysing the responses we came to the conclusion that vast majority of the respondents, 82% of them stated that they use both types of examination equally, 18% of the respondents stated that they use written examination method more often, while none of the teachers used verbal examination more often.

This work includes five sub hypothesis, from wich three were not confirmed. From that we can conclude that main hypothesis: "Teachers have positive experiences with descriptive grading, that beside numerical grading method is increasingly present" is not confirmed.

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