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**The assessment methods that are used in a secondary mathematics class**

**Métodos de evaluación utilizados en una clase de matemáticas en enseñanza secundaria**

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**Resumen**

Podría afirmarse que la prueba "tradicional", en matemáticas, no proporciona una medida válida de la capacidad del alumno, por cuestiones relacionadas con diferencias individuales entre estudiantes, el dominio de contenidos y el énfasis que recientemente está adoptando la evaluación de las capacidades significativamente contextualizadas y los procesos cognitivos de orden superior. Por consiguiente, es necesario incorporar métodos alternativos de evaluación que sean capaces de evaluar eficazmente la gama de habilidades matemáticas de los estudiantes. Este artículo se dirige a comprender los métodos de evaluación que los profesores de matemáticas de Educación Secundaria usan para evaluar a sus estudiantes. La investigación trata, sobre todo, de iluminar 1- Los principales métodos empleados por profesorado de matemáticas, 2- El uso informado de métodos de evaluación alternativos, 3- Los métodos de evaluación deseables, 4-La satisfacción de los profesores con los métodos tradicionales. Los resultados muestran que los profesores utilizan principalmente los exámenes escritos para evaluar a sus estudiantes, informan del uso de algún tipo de evaluación alternativa que de forma esporádica, y muestran insatisfacción con los métodos que utilizan y prefieren utilizar la observación directa para evaluar a los estudiantes. Y por último los profesores dan algunas sugerencias para mejorar las prácticas de evaluación actuales.

**Abstract**

Given issues related to differences in learner characteristics, effective sampling across the content domain and recent emphases on assessing meaningfully contextualized abilities and higher-order cognitive processes, the 'traditional' mathematics test arguably does not provide a valid measure of student ability. Consequently, there is a need to incorporate alternative methods of assessment that are able to effectively assess the range of students' mathematical abilities. This article try to understand the assessment methods that mathematics secondary teachers use to assess their students, mainly this study will try to spot the light on 1- The main methods employed by Mathematics teachers, 2- Reported use of alternative assessment, 3- Desirable assessment methods, 4- Teachers' satisfactions with traditional methods. Results showed that teachers mainly use written exams to assess their student, they reported using some alternative assessment but sporadically, the teachers showed dissatisfaction with the methods they use and they prefer using direct observation to assess their students. And finally the teachers gave some suggestions for improving the current assessment Practices.

**Palabras clave**

Evaluación alternativa; Métodos tradicionales de evaluación; Profesores de Matemáticas; Escuela Secundaria.

**Keywords**

Alternative assessment; Traditional methods of assessment; Mathematics teachers; Secondary school.

## 1. Introduction

With the rapid technological development the need for students who have cognitive skills such as problem solving, critical thinking, analyzing data, and presenting them orally and written format have increased (Dochy, 2001), that demand alternative forms of assessment to assess both learning process and learning outcomes. The Assessment Standards for School Mathematics NCTM (1995) recommend that assessment should contribute to students' learning. Black and William (1998, p.19) pointed that assessment should be integrated in the teaching and learning process. "Assessment is to be seen as a moment of learning, and students have to be active in their own assessment and to picture their own learning in the light of an understanding of what it means to get better".

*"If educational measurement doesn't lead to better education for students, then we shouldn't be doing it ... the only reason educators ought to assess students is in order to make more defensible educational decisions regarding those students. That's really why educators should be messing around with measurement-to improve student learning"* (Popham, 2000, p.1).

This requires assessment techniques that focus on assessing what students know as well as what they do not know, and the use of multiple and complex assessment tools including written, oral, and demonstrations formats. Therefore, alternative assessment tools, such as rubrics, concept maps, portfolios, student Journals, self-assessments, and peer/group assessments are necessary to determine what students actually known and where they are in the learning process (Anderson, 1998; Birgin, 2011).

Buhagiar (2007) argued that in order to provide every student with the best learning opportunity, traditional ways of assessment should be replaced by alternative forms of assessment: "If we truly believe in inclusion and diversity-which builds on the understanding that everyone is capable of learning and worthy of the best possible investment in his or her education-it becomes unsustainable to continue using an assessment model that has traditionally developed to focus on selection, certification and accountability" (Buhagiar, 2007, p.41).

Alternative assessment is based on the constructivism philosophy, Piaget's and Vygotsky's emphasize the importance of students constructing and supplying responses rather than selecting or choosing them (Dogan, 2011). Janisch, Liu, and Akrofi (2007, p.221) clarify the importance of using alternative assessment methods in the classrooms: "The theoretical framework for using alternative assessment in the classroom includes considering learners as constructors of knowledge; finding authenticity in materials and activities; employing dynamic, ongoing evaluation tools; and empowering students. By putting these ideas into practice, individual attributes of initiative, choice, vision, self-discipline, compassion, trust, and spontaneity can be promoted in students."

Despite the wide spread efforts to change the overall philosophy of assessment, many mathematics teachers' still use multiple-choice and short answer question exams to assess students' progress in Mathematics. These formats assess mainly memorization and recalling of facts and do not assess higher order-thinking. These assessment methods do not encourage creativity and innovation, so the traditional teaching and assessment strategies create distance between students and lecturers and encourage students to focus on retention of facts (Kim & Noh, 2010).

Rico (1993) argued that the Spanish educational system is still traditional. the model of evolution in Spain is basically centered on paper and pencil tests in which students must demonstrate their mastery of facts, skills and definitions which are the most basic and simple mathematical knowledge. Rarely Proposed students with creative activities or assessed their competence to deal with tasks no previously tested and those with which test all their knowledge in a particular field. Stigging (2004) agreed that educators still assess student learning the way their predecessors did 60 years ago.

This article try to understand the assessment methods that mathematics secondary teachers use to assess their students, mainly this study will try to spot the light on 1- the main methods employed by Mathematics teachers, 2-Reported use of alternative assessment,3-Desirable assessment methods, 4-Teachers' satisfactions with traditional methods, 5-Teachers suggestions for improving the current assessment Practices.

## **2. Method**

This is a case-study qualitative research, which is an inductive inquiry strategy of approaching a setting without pre-extant assumptions. A case study is an intensive analysis of an individual unit (e.g., a person, group, or event) stressing developmental factors in relation to context (Flyvbjerg, 2006).

The case study research aims to explore an issue in a bound context or setting, using one or more cases within this context (Creswell, 2007). Thus, the case study is suitable for investigating the central phenomenon of this study, since the main aim of the researcher is to understand the methods that secondary mathematics teachers use assess their students, Case study is an excellent choice for researchers who want to intensively and deeply examine an issue (Creswell, 2007).

## **3. Participants**

Two secondary Mathematics teachers drawn from public schools in Granada participated in this study. The school was chosen because of its proximity to the researcher. Teacher (A) and teacher (B).

## **4. Instrumentation**

One-on-one interviews were used as a source of the data. Every teacher was interviewed four times.

## **5. Procedures**

The qualitative data were collected in Spanish language and then translated to English language. One-on-one interviews were used as a source of the data.

The interviews were made by the researcher and were audio taped. The teachers were interviewed four times; the questions were formulated based on reviewing the literature. Immediately following each interview the recording was transcript, the participant was provided with the opportunity to make amendments to the transcript, or to withdraw any information that they were uncomfortable with, upon receiving the transcript back from the participants, the entire document was once again reviewed, and the names of the participants and the school were removed.

## **6. Data analysis**

The analysis of the qualitative data was guided by the framework suggested by Miles and Huberman (1994) which involves data reduction, data display, and drawing conclusions and verification. Data reduction refers to the processes of selecting, simplifying, abstracting and transforming data into themes by coding (Creswell, 2007; Miles & Huberman, 1994). These coded data were then organized and assembled into representations including mind maps and case summaries. This process is known as data display. The final stage in the data analysis was drawing conclusions and verification from the data. The findings discussed in this research were obtained by performing single-case analysis for each of the two teachers with the help of the Nvivo software.

## **7. Results**

1-What are the methods that a secondary Mathematics teachers use to assess their students?

### **7.1 The main methods employed by Mathematics teachers**

The main forms of assessment that teachers use to evaluate their students in mathematics in the secondary stage, according to the teachers they assess:

- 70% of the students work by written exams.
- 15% students' attitude toward the subject and towards the members of the educational community (By unclear methods).
- 15% left daily work at home and in class (By unclear methods).

They added that they evaluate their students with written exams during the whole year, they don't change. And clarified that maybe teachers in other subjects as languages use other forms of assessment, but generally, in mathematics they use written tests, teacher (A) noted that she doesn't know anyone that uses other forms of assessment.

A part of the 30% of the students' grade comes from the student notebook. The grade of the notebook is given every semester, but daily the teacher have a look at her students notebook and check if the students did their homework and if it's clean or not, she doesn't assign a numerical grade daily, but she usually put expression such as good / bad / regular or positive / negative, as a part of the daily work.

The teachers noted that they use direct questions to see if their students understand what teacher wants, the teachers normally explain the subject and then ask a question and if the all the students remain silent that mean that they have not understand.

They always assess student after each unit or a group of units, they never did it during the unit. Also she is used to give her students many exams and students score is the average of all the scores.

## **7.2 Reported use of alternative assessment**

Although the most common method to evaluate students work in Spain according to the teachers is the exam, the teachers pointed that recently they are investigating the group work in which the teacher divides the class in to groups and assigns a task to every member of the group.

At the same time, the teachers asserted that recently there are a lot of calls to use competencies based evaluation instead of content based evaluation, this year they received some training from the center about how to evaluate competences rather than blocks of contents; they showed them some classes in which they used group and collaborative work, some teacher tried to use it. But it's (still green) under investigation.

When teacher (B) was asked if she use alternative forms of assessment, she said that she sometimes use projects, groups and collaborative work, but "normally I use direct observation in the classroom, problem solving strategies, group work, present a topic how do they express orally to the public, then content exams" (Interview 3).

Teacher (B) added that "before I start a new subject I make sure that the students have the necessary previous ideas, if they can apply what they learn, how did they assimilate it, and how do they explain it to each other make as a professor, I make sure that my students understand the content by asking a lot of question, let the student participate in class, solve problems at the bored, and I let some students give a class as a teacher, in this way I know If they understand or no" (Interview 2).

Furthermore teacher (B) highlighted the importance for exploring and using new forms of assessment such as competition, "we have to search for a methods to motivate the students added the teacher, for example this year we participated in a statistic competition, the students were motivated, also we went to Sevilla to record some videos for the science exhibition , and the students were motivated, and they said: This is what we prefer. Because they saw that what they are learning can be applied in real life situation"(Interview 2)

Also she said that she know some teachers who have invited parents to participate in group work among the class, its collaborative work between teachers, parents, but the teacher argued that it can be done sporadically. First, not all parents are willing to participate or they do not have free time. And the second thing is the teacher has to put a lot of effort.

One of the methods the teacher (A) used this year with a group of students in the second semester, she tried not to evaluate them by test, because she had only (13) students she assessed them by reviewing everything they have done at class and at home, and it was successful. But what happens is that even so, there are (5) of the (13) haven't even been able to keep up with this pace, because they didn't study.

One of the strategy that she also used to help her student to learn, was to ask her students to copy the necessary theories from their books, since the students have to return their book at the end of the year, and her goal was to let them use these formulas to solve activities that contain finding the area and the volume of some geometric shape, and she assessed them accordingly.

When Teacher (A) was asked if she use more than one method to evaluate her students she answered: In high school she prefer following a harder and more rigid and more traditional evaluation process, because there is an agenda and a schedule to meet and a syllabus to follow, and also they cannot decrease the level we must take in our account the compulsory syllabus in high school. But in the ESO (Secondary Education) she added that they can use different forms of evaluation, evaluation criteria, and other ways of evaluating that are based on the students work, on the students' daily work, and on their behavior and attitude.

Teacher (A) also pointed that she didn't used rubric or self and peer assessment before, sometimes she evaluated students' skills on using calculators, and she admitted that: "We evaluate what we think they have learned. We don't have any strategy that the students can participate in the evaluation process" (Interview 4).

### **7.3 Desirable assessment methods**

Teacher (A) said that next year she will propose using peer and self assessment with her students, according to her when the students are involved in the evaluation process, they can see their weakness point. Also the students can correct honestly, sometimes they are stricter than the teacher, which is good because it makes them aware and feels more involved in the education process, and these things are good for the students' character.

Both teachers pointed that they would enjoy more evaluating the students by direct observation, not by tests, without papers, just watching students work and its evolution, but of course this is impossible complained the teacher, because of the large number of students they have in class, they have sometimes (30) students, it is impossible to do anything like that.

According to teacher (A) she would try to evaluate her students by directly observe their work, because: "In this way the learning process and the student's improvement and evolution can be evaluated better"(interview 1).

### **7.4 Teachers' satisfactions with traditional methods**

The teachers were not satisfied with the traditional methods of assessment, as students' results are not good; and there are a lot of school failure and repetitions. Teacher(A) pointed that mathematics teachers agreed that something should be done to overcome this school failure, because the things are not going as they want, the results are very bad, and the students levels in mathematics is very low.

Teacher (A) commented that for the most students the teaching-learning process is not complete. "Teachers teach or explain until we think that students understand or comprehend the concepts. Then we check this degree of students understanding by asking certain student to solve a problem on the board, which is not enough for all the students" (Interview 3).

Along the teacher experience for 20 years she noticed that in the past it was normal to find in a class 10 students that are very good, and 2 or 3 that are very bad and the rest are normal, but according to the teacher the situation have changed, now you can find one or 2 very good students and 10 very bad students and the rest are normal. She commented that's a result of the bad evaluation system as the student can pass the course even though he doesn't have the accepted mathematical level.

Teacher (B) was relatively satisfied with the traditional methods of assessment; according to the teacher the exam is the best way to help the students to assimilate the concepts.

She doesn't prefer using more than one evaluation method as the students will get lost, according to the teacher the student have to get all the evaluation method that will be used at the begging of the academic year.



On the second interview teacher(B) expressed her dissatisfaction of the traditional methods, she said that they are obliged to evaluate their students with the numerical grades by exams, some time they are not satisfied but they are obliged.

She added that there is no one method of evaluation that is perfect and suitable for all the students, every group of student has their own way of learning, then the teacher has to follow the learning way of his students, as there are a lot of diversity among the students then one certain method is not enough for all the students.

The teacher noted that "normally they taught us to put a numerical grade for the students advance in learning, I think it's not good, we have to see the effort that the student put and if you have acquired at least some of what we tried to teach them" (Interview 2).

Teacher(B) also said that this is not on the hands of the teachers this all set by the department of mathematics, all the evaluation criteria and methods in the school are fixed by the department.

### **7.5 Teachers suggestions for improving the current assessment practices**

The teachers suggested the following in order to enhance assessment current practices:

Teachers have to be more like psychologists and less like judges of the children. They must change their way of thinking, as teachers are used to evaluate only what students know or what they have learned, they should learn to evaluate the development and the learning process, from beginning until end, that's what teachers should value more.

Also teachers should be provided with a lot of information and training in the new evaluation techniques, as teachers do not know how to evaluate well; they need a lot of information and training.

They also recommended that teacher should participate in professional development seminars and conferences as it's one of the most interesting things that can improve the results of the students, also mathematics teachers should concentrate on helping the students use what they learn in real life situations, by providing them with more exercises and more practice.

On the other hand teachers should work to enhance their assessments strategy, "The only way would be to recycle ourselves, because we are stagnant in the same way for more than twenty years ago, and things have changed"(Interview 1).

Teacher(A) recommended changing the law of the minimum effort as it affect both the teachers and the students negatively, the students don't make any additional effort to enhance their work, and as a sequence the teacher evaluate only to see who get the required minimum level, and to see who success and who fail. "When the student knows that they can pass the course with minimum effort they will never put more effort to have the same result "(Interview 4 ).

Also they suggested that the student who fails two subjects shouldn't pass the course, in order not to join the failure in of the young with the old.

They also recommended that the teacher should keep searching for new methods to motivate their students. They added that not only the students need to be motivated but also the teachers; using new forms of assessment give the teacher satisfaction and motivation. One teacher suggested that teachers should be motivated through an external exams or events that the student can see that their teacher is better prepared than the others.

They also recommended changing the department policy about assessment as follows:

- To give the teacher the right to evaluate their students as they find it suitable.
- To change the current evaluation percentage which is 70% for written exams and 30% for the students' attitude and his note book. As some students can pass the course without having the adequate mathematical level.
- The teacher shouldn't be asked to do administrative work; the teacher complained that the department asked her to do a lot of papers.
- Teachers shouldn't be obliged to assign a numerical number when she evaluates her students, and to have the opportunity to evaluate her students properly.
- Exam should be eliminated, as the exams do not seem to be a good evaluation tool.
- Students should be evaluated by direct observation.

- The high number of students in classes should be changed.

## 8. Discussion

The results of this study showed that the main form of assessment that teachers use to evaluate their students in mathematics in the secondary stage is written exams, teachers usually made exam after every unit or a group of units, they use numbers from (0-10) to grade these exams, and the final grade of the students is the average of these exams.

This study also revealed that teachers were not satisfied with traditional methods of assessment because the students' results are not good; and there are a lot of school failure and repetitions. One teacher pointed that mathematics teachers agreed that something should be done to overcome this school failure, because the things are not going as they want, the results are very bad, and the students levels in mathematics is very low.

They reported using some alternative assessment but sporadically, such as group work, Competition, inviting parents to participate in group work, presenting their work orally. But these forms don't affect students grade, students' grade normally comes from:

- 70% of the students work by written exams.
- 15% students' attitude toward the subject and towards the members of the educational community (By unclear methods).
- 15% left daily work at home and in class (By unclear methods).

Although assessment reform has now been a major educational issue in many countries including Spain the characteristics of the evaluation system the teachers are following in 2013 are similar to characteristics of the evaluation system before 20 years which was mentioned on Rico (1993):

1. There is a rigid pattern of timing, since the assessment is centered on one or two written tests each term, with some weeks dedicated exclusively to carrying out examination or reexamination.
2. The explicit aim of the tests is to give a course mark.
3. The overall character of the marks given to the students is that of a summary of different aspects and information obtained with different exercises; the complexity of the learning achieved by the pupils is masked by assessment that yields one item of information.
4. The level of an accepted command of the knowledge is indicated by an arbitrary line, which is called the "pass level" or to have a five (i.e. to get 5 out of 10)
5. Neither the students' mistakes nor their unanswered questions are in any sense evaluated.
6. There is a compulsory retest in September for a considerable number of unsuccessful students; those who don't pass the retest must repeat the course (Rico, 1993).

Black (1998) argued that the main weaknesses in class room assessment are that:

- Classroom evaluation practices generally encourage superficial and rote learning, concentrating on recall of isolated details, usually items of knowledge which pupils soon forget.
- Teachers do not generally review the assessment questions that they use and do not discuss them critically with peers, so there is little reflection on what is being assessed.
- The grading function is over-emphasized and the learning function underemphasized.
- There is a tendency to use a normative rather than a criterion approach, which emphasizes competition between pupils rather than personal improvement of each.
- The evidence is that with such practices the effect of feedback is to teach the weaker pupils that they lack ability, so that they are de-motivated and lose confidence in their own capacity to learn. (Black, 1998, 111)

Shulman (1986) asserted that the assessment of mathematics learning remained virtually unchanged throughout most of the last half century. Berenson and Carter (1995) said that traditional assessments have contributed to students' pursuits of grades rather than pursuits of learning. They suggest that broadening the system to include alternative assessments that provide an opportunity for students to make conceptual connections and reflect on understanding can refocus students towards the pursuit of learning.



According to Moskal (2000) a single score can't provide the students the needed feedback. For example, a student who gets a 70 out of a 100 may not know how to improve his/her performance on the next assignment. With a single score, students are often left with a lack of clarity on the specific cause of drop in points or how to improve. In contrast, well-written instructional rubrics can provide clearness and equity to the process, can provide the student useful feedback, and can precisely indicate performance expectations using a variety of categories that focus on specific criteria. Thus, they assist students in better understanding how the instructor scores their papers (Andrade, 2000).

The result of this study supports Altinişik, Demirbaş, and Bayrakci (2011) study results that teachers mostly use filling in the blanks, multiple choice tests, true or false, written examinations, project and performance evaluation activities, while they least frequently use structured grid and diagnostic branched tree activities. The teachers have also expressed that they do not frequently use alternative measurement and evaluation techniques due to the time limit.

Also Grimison (1992) study result that indicates that: 1-Traditional written tests dominate other forms of assessment. 2- Attitudes to using alternative methods of assessment in the class room were fairly negative, 3-The most common forms of alternative assessment were, oral, practical, observation, and students' journals, many teachers indicated that many of these forms were used in their assessment, but only as informal assessment which didn't contribute to the final mark.

Also it supports the results of Watt (2005) study that indicate that the main assessment method teachers reported using was the traditional mathematics test. Other methods they listed were assignments and bookwork/homework (which likely overlap each other), observation, problem solving, practical work, oral work, and group work. Of alternative assessment methods, the most common form used was assignments, followed by observation. Raboijane (2006) results also showed that few mathematics teachers use alternative assessment methods.

Beckmann, Senk and Thompson (1997) studied the assessment and grading practices of 19 high school mathematics teachers. Their study revealed that the most frequently used assessment tools were tests and quizzes and these determined about 77% of students' grades. Twelve of the nineteen teachers used other forms of assessment, such as written projects or interviews with students. These other forms of assessment counted for about 7% of students' grades. They also found that test items were of low level, involved very little reasoning and were almost never open-ended.

Fennel, Heiss, Kobett & Sammons (1992) suggest that specific training is necessary for teachers to learn to assess children's thinking by analyzing students' discourse. Dean (1999) contends that most teacher education programs skim over classroom assessment, leaving teachers to assess in the way they were assessed when they were in school.

Susuwele-Banda (2005) revealed that the teachers had limited ways and methods of assessing their students. These teachers mainly used tests to assess their students. Although teachers gave individual exercises toward the end of every lesson, the exercises were given to the students to practice and consolidate what the teacher had just demonstrated. This kind of approach encourages memorization of procedures and processes. Also revealed that teachers use test results to promote students from one grade level to the next and also to check if they have mastered the subject matter at the end of a topic or term. This seems to suggest that assessment means testing.

Morgan and Watson (2002) reported that most middle and high school teachers use teacher-constructed tests to assess students' achievement. In addition, Morgan and Watson found that most teachers view classroom assessment as an added requirement to their teaching job and not as a tool to improve their teaching.

Cooney (1992), Garet and Mills (1995) found similar results. Cooney surveyed high school mathematics teachers' assessment practices while Garet and Mills surveyed grade 4 to 12 mathematics teachers across the United States. Both studies reported that teachers mostly used short-answer tests for assessment. The two studies further reported that there was a strong influence of readymade tests on classroom practices. Teachers use the readymade tests without making modifications to them (Cooney, 1992; Garet & Mills, 1995).

The results of the current study indicate that teachers are not satisfied with the assessment methods they use, this result counter Watt (2005) results that showed that teachers were satisfied with traditional tests as valid measures of student ability. Teachers in her study did not favour implementing alternative assessment methods, although those with the least years' teaching

experience reported more positive attitudes. A major concern raised by teachers about the use of alternative assessment methods related to their perceived subjectivity.

Rico (1993) asserted that the intellectual restlessness of the Spanish teachers in general basic education with respect to assessment is an indicator of their awareness that at the moment there is a strong need to orientate the evaluations and judgments of the teacher in direction that will contribute to effective learning and to the development of self-esteem, communication ability, and social integration. Teacher (A) noted: "I think the form of assessment, like so many things in education, must be changed. Not because it's bad, but because the results and the level of our students is not as we want" (Interview 3).

In order to enhance the assessment in mathematics according to Rico (1993):

1. Teachers should consider assessment as a continuous and interdependent process with the other components in the curriculum; content, objective and methodology, but rather must be contemplated as interconnected. Assessment is not an isolated single element but one that should impregnate all the stages that make up mathematics teaching and learning.
2. The formative and orientate character of assessment is another idea that has to be developed, assessment should be considered a critical judgments that stimulates, orientates, and promotes better understanding, and a greater control of knowledge on the part of students, that shows success, and that make them feel satisfied with the effort. The teacher should stimulate and develop this style of working on a daily base.
3. Teachers need to use a variety of methods and instruments, some that are systematic, and others that favor the creative aspects of mathematics (Rico, 1993).

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## 10. References

- Altinışik, D., Demirbaş, M., & Bayrakci, M. (2012). The primary school teachers views related to the alternative measurement and evaluation activities. *New perspective in science education*. Retrieved from <http://conference.pixel-online.net>.
- Anderson, R.S. (1998). Why talk about different ways to grade? The shift from traditional assessment to alternative assessment. *New directions for Teaching and Learning*, 1998(74), 5-16. DOI: 10.1002/tl.7401
- Andrade, H. G. (2000). Using rubrics to promote thinking and learning. *Educational Leadership*, 57(5), 13-19.
- Beckmann, C.E., Senk, S.L., & Thompson, D.R. (1997). Assessment and grading in high school mathematics classroom. *Journal for Research and Mathematics Education*, 28(2), 187-215. Retrieved from :<http://www.jstor.org/stable/749761>
- Berenson, S. B., & Carter, G. S. (1995). Changing assessment practices in science and mathematics. *School Science and Mathematics*, 95(4), 182-186. DOI: 10.1111/j.1949-8594.1995.tb15759.x
- Birgin, O. (2011). Pre-service mathematics teachers' views on the use of portfolios in their education as an alternative assessment method. *Educational Research and Reviews*, 6(11), 710-721. Retrieved from <http://www.academicjournals.org>
- Black, P. (2002). *Testing: friend or foe?: theory and practice of assessment and testing* [Adobe Digital Edition Version]. Routledge.
- Black, P., & William, D. (1998). *Inside the black box: Raising standards through classroom assessment* [Adobe Digital Edition Version]. Department of education and professional studies, King college, London.
- Buhagiar, M. A. (2007). Classroom assessment within the alternative assessment paradigm: revisiting the territory. *The Curriculum Journal*, 18(1), 39-56. DOI: 10.1080/09585170701292174
- Cooney, T. (1992). *A Survey of secondary teachers' evaluation practices in the state of Georgia*. Unpublished manuscript, College of Education, University of Georgia, Athens.

- Creswell, W. (2007). *Qualitative inquiry & research design: Choosing among five approaches*, Lincoln: Sage Publications, Inc.
- Dean, J. (1999). *Improving the primary school*. London, Routledge.
- Dochy, F. (2001). A New Assessment Era: Different Needs, New Challenges. *Learning and Instruction*, 10 (1), 11-20.
- Dogan, M. (2011). Student teachers' views about assessment and evaluation methods in mathematics. *Educational Research and Reviews*, 6(5), 417-431. Retrieved from <http://www.academicjournals.org>
- Fennel, F., Heiss, J., Kobett, B., & Sammons, K. B. (1992). Linking instruction and assessment in the mathematics classroom. *Arithmetic Teacher*. 39(6), 11-16.
- Flyvbjerg, B. (2006). Five misunderstandings about case-study research. *Qualitative inquiry*, 12(2), 219-245. Doi: 10.1177/1077800405284363
- Garet, M.S. & Mills, V.L. (1995). Changes in teaching practices: The effects of the curriculum and evaluation standards. *Mathematics Teachers*. 88(5), 380- 389.
- Grimison, L. (1992). *Assessment in Mathematics – Some Alternatives*. In Mathematics Education Research Group of Australasia 15th Annual Conference, University of Western Sydney.
- Janisch, C., Liu, X., & Akrofi, A. (2007). Implementing alternative assessment: Opportunities and obstacles. *In The Educational Forum*, 71, (3), 221-230. DOI: 10.1080/00131720709335007
- Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook*. Sage Publications, Incorporated.
- Morgan, C., & Watson, A. (2002). The interpretative nature of teachers' assessment of students' mathematics: Issues for equity. *Journal for Research in Mathematics Education*, 33(2). 78-110. Retrieved from <http://www.jstor.org/stable/749645>
- Moskal, B. (2000). Scoring rubrics: what, when and how? *Practical Assessment, Research & Evaluation*, 7(3), 1-7. Retrieved from <http://www.peopledev.co.za>
- National Council of Teachers of Mathematics. (1995). *Principles and standards for school mathematics*. Reston: Virginia.
- Popham, W. J. (2000). *Modern educational measurement: Practical guidelines for educational leaders*. (6th ed.). Boston: Allyn & Bacon.
- Rabojane, B. (2006). *Mathematics teachers' understanding of alternative assessment as applied in junior secondary schools in Gaborone (Botswana)*, Doctoral dissertation. Retrieved from <http://hdl.handle.net/10539/1610>
- Rico, L. (1993). *Mathematics assessment in the Spanish educational system. Cases of assessment in mathematics education*, 1, 9-20. Retrieved from <http://link.springer.com>
- Shulman, L. S. (1986). Those who understand: Knowledge and growth in teaching. *Educational Researcher*, 15(2), 4-14. Retrieved from <http://www.jstor.org/stable/1175860>
- Stiggins, R. (2004). New Assessment Beliefs for a New School Mission, *Phi Delta Kappan*, 86 (1), 22-27. Retrieved from <http://www.powayusd.com>
- Susuwele-Banda, W. J. (2005). *Classroom assessment in Malawi: teachers' perceptions and practices in mathematics*, Doctoral dissertation, Virginia Polytechnic Institute and State University. Retrieved from <http://scholar.lib.vt.edu>
- Watt, H. M. (2005). Attitudes to the use of alternative assessment methods in mathematics: A study with secondary mathematics teachers in Sydney, Australia. *Educational studies in mathematics*, 58(1), 21-44. Retrieved from <http://link.springer.com>