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A Conceptual Framework for a Study of Assessment Perspective and Practices: Assessment as a Vector with Six Components

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ABSTRACT
Assessment has a very important role in the teaching and learning process. The aim of this study is to present a framework for studying inside the classroom. The paper starts with a review of literature about the current issues about assessment. This framework is useful for studying teachers' attitudes about the assessment process. The paper, then, explains these six domains of assessment: (1) formal vs. informal, (2) convergent or divergent, (3) final or continuous, (4) summative or formative, (5) external or internal, and (6) competitive or co-operative

Keywords: Assessment, Classroom practices, Attitudes towards assessment, Mathematics education.

INTRODUCTION

Assessment is a widely researched area. An important practical effect of assessment is its immense influence on teaching and thus on learning. It is felt that teaching should start from what we know about pupils' learning. From this standpoint assessment has a mediating role between teaching and learning (Ayas, Aydin, & Corlu, 2013). Developments in concepts and practices of assessment have not developed in parallel with those in the theory and practice in a given area of teachingand that the same tools and methods of assessment have been used for over a century (Niss, 1993). On the positive side, there has been paradigmatic and curricular changes, at the international level in the past forty years, towards the recognition of individual differences, towards giving emphasis to process rather than content and practical work (DES, 1988; MoNE, 2013, 2017) . These are the characteristics of a move away from a psychometric assessment to an educational measurement paradigm (Gipps, 1994, p.10).

ASSESSMENT PARADIGMS

The nature of assessment of mathematics in the educational systems has been subject to remarkable changes worldwide, which reflected a profound shift in the conceptions of assessment in many of the developed countries of the world. There are strong pressures for raising standards for all pupils. The emphasis on selecting the ablest (norm referencing) is being replaced by judging against a criteria (criterion referencing), the recognition of individual differences, more emphasis given on process rather than content and practical work, and less emphasis on factual knowledge. In turn these changes reflected shifts between the three major paradigms in educational psychology: psychometrics, educational measurement, and educational assessment. The underlying philosophy of psychometrics was the conception of intelligence as being a fixed trait, which could be measurable. Norm referenced tests were the basic source for information. The basic tenet of the educational measurement movement is its

positioning in opposition to the idea of norm referencing (Gipps, 1994, p.11). Characteristics of the educational measurement movement are (1) criterion-referencing, (2) competence rather than intelligence, (3) uncontrollability of the measurement conditions, (4) best rather than typical performance, and (6) helping rather than sentencing the individual. The basic idea of the third paradigm, educational assessment, simply is assessment to support learning (Wood, 1986). Portfolios of accomplishments, situations which elicit problem solving behaviour, and appropriate scoring procedures fall into this category. What is felt to be needed is a wider range of assessment techniques for a wider range of cognitive skills (Corlu & Aydin, 2016).

Pressures for change that led to this paradigm have come in at least three areas. The first is a growing desire to broaden education, to develop - and consequently to assess - a much broader range of pupil abilities which necessities the use of a wide range of assessment techniques (NCTM, 1995; NSTA, 2000). The second is the desire to harness the full power of assessment and feedback in support of learning. The third arises from the belief that education should lead to a capacity for independent judgement and an ability to evaluate one's own performance - and that these abilities can only be developed through involvement in the assessment process (Kulm, 2013)

The changes in school mathematics that occurred in both curricula and teaching methods have caused changes in internal and external assessment. This, according to Lesh and Lamon (1992) is a complete paradigm shift involving new sources of assessment information about the nature of mathematics, its teaching and learning: (1) Mathematics is, now, more than a list of mechanical rules but a science of pattern building, (2) Mathematics learning is an active process of continuous construction of knowledge and (3) New mathematics teaching moves away from lecturing, explanation and decontextualised problem solving towards helping pupils construct their own knowledge

This shift also involves clarifying the purposes of assessment and establishing standards for judging the quality of assessment (NCTM, 1995). Three more purposes other than grading were identified as monitoring pupils' progress, making instructional decisions and evaluating programs. An attempt, also, was made to establish standards for school mathematics (NCTM, 1995):

- Mathematics: Assessment should focus on important mathematics
- Learning: Assessment should be an integral part of the learning process rather than an interruption.
- Equity and opportunity: Assessment should give every pupil opportunity to demonstrate mathematical power.
- Openness: Pupils should be served by open assessments
- Inferences: Validity needs to be judged by examining the inferences made from an assessment
- Coherence: Each assessment should be appropriate for the purposes for which it is used.

The paradigmatic shift in assessment is towards greater integration between assessment and learning representing a move away from using restricted forms of testing that are weakly linked to pupils' learning, and have inspired hopes that improvement in classroom assessment would make a strong contribution to the improvement of learning (Black and Wiliam, 1998).

The reflection of this paradigmatic shift in ordinary teachers' conceptions about assessment is a slow process (Black, 1991). Buttler and Beasley (1987) study reports about a curricular change in Queensland, Australia. The change from external to school based certification had taken effect from 1972 but it took 13 years to observe its effect on classroom practice, only after the government-led change from a summative norm-based to a formative criterion-based system.

AIM OF THE STUDY

The investigation of teachers' beliefs and practices on assessment is important in that it has an influence, directly or indirectly, on the quality of learning taking place in the classroom. By studying the implicit

theories of teachers, it may be possible to understand the reference frames which guide teachers' actions. In spite of its enormous importance, few studies are available on teachers' attitudes to assessment (Kyriakides, 1996; Philippou & Christou, 1997; Türnüklü, 2003; Ören, et al., 2011; Ektem, et al, 2016). Teachers are caught on the horns of several teaching and assessment dilemmas in the classroom. One of them pertains to the use of assessment tools as being traditional or non-traditional. Some educators contend that traditional test scores are inadequate as measures of educational achievement or performance in mathematics in that they are not authentic in terms of reflecting pupils' performance on tasks meaningful to them (Kulm, 1990), but the alternatives such as investigative tasks which appear to have educational relevance bring problems with regard to internal consistency, inter-rater reliability and fair comparability. If a teacher is to give a trustworthy report of the merit of each pupil's progress and attainment relative to the class and across classes, then this dilemma can be constraining to the teacher. In practice it is important to consider how teachers act if they perceive these and other similar dilemmas. The dichotomous nature of the most of the categories of this study followed from the fact that these dilemmas are real and important.

The development of the six study categories followed from a deductive approach in which, the researcher analysed the findings from literature and constructed a framework for analysing 'perspectives of assessment'. Assessment has different dimensions. It was given attention that the categories span the full spectrum of these dimensions. After a literature review it was concluded that the perspective of assessment in mathematics should consist of a total of six domains. They are referred to as the modes of assessment (Rowntree, 1987, chapter 5).

Six categories are designed to address the modes of assessment (Rowntree, 1987, chapter 5) which answer the vital questions such as "what to assess", "why assess", "how to assess, "when to assess" and "who should assess". 'What to assess' relates to the characteristics of assessment, i.e. 'assessment as convergent or divergent'. 'Why assess' relates to the purpose of assessment e.g. 'assessment as summative or formative. 'How to assess' relates to procedures of assessment, e.g. 'assessment as competitive or co-operative'. 'When to assess' relates to the frequency of assessments, e.g. 'assessment as final or continuous'. 'Who should assess' relates to main assessment agent, e.g. 'assessment as external or internal'. The other category, 'assessment as formal or informal' is related to both purpose, i.e. 'why assess' and 'how to assess'. The reason why the six categories of the study are of a dichotomous nature is to be able fully to reflect such dilemmas encountered by the teachers.

Metaphorically speaking these six categories can be considered as a vector depicting the status of a given assessment event. In the terms of linear algebra any assessment event (e.g. x) can be described as a vector with n components such as (e.g. x = x1, x2,..,x6) (Lay, et al., 2016). These six categories/dimensions are explained in detail in the next section.

DIMENSIONS OF ASSESSMENT

1. Formal vs. informal assessment dimension

One of the ways in which Magajna (1998) distinguishes between formal and informal learning is in terms of the purpose of learning. In formal learning he states that the purpose of learning is the object of learning whereas in informal learning, learning occurs spontaneously independent of the intention of the learner. Formal and informal assessment can be distinguished in a similar way. Formal assessment takes place in controlled conditions, whereas for informal assessment, there is no precondition. It can happen anytime on the basis of what the pupils are doing anyway and sometimes the assessor may do it unconsciously. The purpose of assessment is well known both by the assessor and the assessed in formal assessment, but informal assessment takes place without the two parties necessarily being aware of it. Formal assessment further involves the interruption of instruction during assessment. Informal

assessment, on the other hand, means getting information about pupils' learning without the cessation of the learning process (Clarke, 1996).

Formal assessment is the basic source of information on individual's performance. Transmission of this information from one institution to another is essential because it is this information, it is assumed, with which predictions about the individual can be made on a more reliable basis. Informal assessment, on the other hand, generally does not have a structure and is rarely systematically recorded. The teacher collects information about the pupils through unplanned observations. It is an issue of 'breadth vs. depth'. If the concern of the assessor is only reporting information, then it is likely that depth of information is sacrificed. On the contrary, if the primary interest is gaining insights to what the pupil really understand, the reliability of that information will probably be low.

Formal assessment includes examinations, practical tests under controlled conditions, and presentations. Rowntree (1987, p.129) cites a number of features of formal assessment situations which make it different from informal assessment situations

- All pupils are given the same task to perform
- The task is performed in the presence of an 'invigilator'.
- All pupils are given same time limit.
- Pupils are not allowed to apply to references, or to one another.
- Pupils usually experience some stress and urgency.

2. Convergent vs. divergent assessment dimension

Problems which have a set goal may be called a closed or convergent, as opposed to problems in which there are more than one correct solution, which is said to be open or divergent. Divergent tasks allow pupils to show how they perform in situations where there is more than one correct answer.Divergent tasks are allegedly more authentic than convergent ones (Romberg et al., 1990).Divergent assessment tasks may give a more accurate idea of how the pupil could perform in real life.

Niss (1993) in addressing the question of 'what to assess in mathematics', concludes that the lower order skills such as facts, standard methods and techniques, and applications are the items that are mostly wanted from the pupils by mathematics teachers. On the other hand, higher order skills such as heuristics and methods of proof; solving non-routine problems; modelling of mathematical situations; and exploration are generally ignored. The lack of emphasis on higher order thinking in school is responsible for widening the gap between school mathematics and real mathematics (see the text edited by Kulm, 1990). As stated in the Learning Standards Yearbook (NCTM, 1995) a shift is required towards learning to name concepts and memorise procedures towards reasoning and communication skills.

3. Final vs. continuous assessment dimension

Rowntree (1987, p.123) states that the tension in this domain is not between continuous and final assessment but on grading. The reason, he argues, is that continuous assessment is what the teachers are doing anyway as part of their teaching independent of whether or not they are aware of this. In his words, the conflict is between 'sudden death play-off 'and 'cumulative track record', in other words, grading taking place only at the end of a course and grading occurs throughout. The distinction is similar to that of summative vs. formative assessment but it is not identical because summative assessment is not necessarily done at the end of a course, neither is continuous assessment always formative (i.e. to provide information to the pupils). In other words, the distinction here is in terms of timing not purpose. There are pros and cons of assessing continuously. It may enable teachers to take a wide sample of pupil performance under a range of different conditions helping them to take individual variations into account and make use of this information as feedback on their teaching. It may, on the other hand, cause stress in some of the pupils resulting from the failure to develop their work rhythms. It is also a

formidable task for teachers requiring that they devote their time and effort especially with the pressures of a coming external examination (Mons, 2009).

4. Summative vs. formative Assessment dimension

Providing information to pupils about their progress and giving them the opportunity to improve in their work is the main purpose of formative assessment. It essentially originated from the behaviourist tradition, specifically Mastery Learning (Bloom, 1968). Objectives are defined and are used by the teachers as guidelines.Pupils' performances on these are measured by the use of formative tests. However this does not need to be mechanistic if the teacher-pupil interaction goes beyond the provision of results obtained from the tests and giving additional teaching accordingly which fits into a social constructivist framework:

What we have here, then, is a notion of assessment which looks forward rather than backwards and which envisages teacher-pupil interaction as part of the assessment process itself (Torrance, 1993).

Summative assessment, by contrast, constitutes a final grade or qualification. This does not necessarily take place at the end of a course of term. As opposed to the domain 'final/continuous assessment' the distinction is defined in terms of purpose in this case. The audience for summative assessment is much larger than that for formative assessment. Furthermore, it is possible that the results of an end-of-term examination (which may normally be called as 'summative') is used for formative purposes, or vice versa (Shorrocks, 1993). However, it must be pointed out that the distinctions between the two domains may be far from straightforward vis a vis teachers understanding of these distinctions.

5. External vs. internal assessment dimension

Teachers' ideas about the relationship between teaching and assessment is the main theme in this domain. In other words, the teachers' views about how integrated teaching and assessment are taken as an indicator of their perception of assessment as either an external or an internal activity. If assessment is perceived as an internal activity it implies an integration, whereas external assessment implies a separation. The tension in this domain relates to the assessor. Should the assessor be an internal (e.g. teacher, one who knows the assessed) or an external agent (one who does not know the assessed). Teachers may be more knowledgeable about their pupils individually, which may make them more valid sources which is, at the same time the cause of the main drawback: its openness to prejudices and misinterpretations. It is this feature of internal assessment which makes it less appealing when the purpose of assessment is summative.

With external assessment, Rowntree (1987, p.141) states "the teacher and the pupils can play the game of 'collaborating' to defeat the assessor." This may be what schools that do not have a coursework option are trying to do. Some teachers think that this is more advantageous than teacher assessment where they feel they are not able to help their pupils. This may explain why 'teaching to the test' practice appears so commonplace (see also p.36, p.129 & p.134).

The duality between external vs. internal assessment, according to Luijten (1988), can also be expressed in terms of a definitive political hypothesis behind it. Namely, externally set papers should represent nationally important learning objectives and subject matter, whereas internal assessment of teachers should give pupils the freedom to develop and express their own objectives within each subject who have some control on their learning. It is possible that some teachers direct their attention towards externally set goals that they may not focus on the individual and individual ways of learning, whereas other give more priority to make sure that assessments result in a meaningful (both socially and cognitively) pupil outcomes. According to Shinn and Hubbard (1992), the tension is between comparison of pupils receiving a 'nationally representative' range of curriculum and instruction (focus on external assessment) and comparison of pupils receiving a 'comparable' curriculum and instruction.

6. Competitive vs. co-operative assessment dimension

The competitive ethic has dominated the Western culture for many years. The theory of 'natural selection' stated by Darwin as "the fittest will survive" is reflected in the scientific world (Ronan, 1983). Competition, which is a major motivator in the Western world, is often believed to be an innate characteristic of human nature, promoting excellence in business, politics and education Quinn & Molloy, 1992).

Traditionally most assessment, especially in secondary schools, has been of the competitive nature. Husen (1983) thinks that a highly competitive system in a 'meritocratic' society could be dangerous for it produces an underclass who do not succeed because of their backgrounds or innate characteristics such as ability. In countries in which there has been a move towards a more egalitarian philosophy, non-competitive forms of assessment start to have an increasing role in shaping the assessment practices (Gipps & Stobard, 1993) which in turn, may influence teachers' attitudes. The idea of criterion-referencing replacing norm-referencing, initiated with the NC, has been a move of that sort. According to Torrance (1993) narrow approaches to assessment results from norm-referencing which may favour a minority but punish the majority and result in reducing the pupil motivation.

A co-operative learning environment, as defined by Johnson and Johnson (1975), is one in which the goals of the separate individuals are so linked that there is a positive correlation between their goal attainments which more likely goes hand-in-hand with criterion referencing. This is contrary to competitive learning environments in which norm referencing, dominates assessment practices which fuels within-class competition (Carter, et al., 1994). In the former, a pupil's success is both relative to and dependent on the success of his/her peers, whereas in the latter, pupils do not have to compete with each other.

Lorenz (1982) attempted to link the framework employed by teachers to their perceptions and treatment of their pupils in which a social reference framework is contrasted with an ideographic reference framework. In the former, the pupils' achievements are compared with each other, which represents an inclination towards norm referencing and (thus) competition in assessment in which pupils' successes are to be explained by stable characteristics like ability. In ideographic reference framework, the comparison is made between pupils' previous achievements and may be linked to criterion referencing.

CONCLUSION

Assessment is complex phenomenon of education which is composed of several dimensions. It has many consequences composing of many dimensions, psychological, sociological, economical. Teachers occupy a very critical position in the process of assessment. Often their attitudes can be very complex, swinging between two extreme positions. Hence a framework needs to have the strength to describe their attitudes in the fullest sense. In this study, framework for studying teachers' perspectives and practices of assessment is provided.

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