Journal of Education and Learning (EduLearn)
Vol. 18, No. 2, May 2024, pp. 331~341
ISSN: 2089-9823 DOI: 10.11591/edulearn.v18i2.21217

A systemic analysis of secondary school mathematics teachers' attitudes toward assessment of learning

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Article Info

Article history:

Received Aug 23, 2023
Revised Oct 9, 2023
Accepted Oct 23, 2023

Keywords:

Assessment of mathematics learning
Assessment practices
Conceptions
Docimology
Practice analysis

ABSTRACT

Aware of the various issues involved in assessing learning, but also of the difficulties encountered in classroom practice of this pedagogical act, we set out in this article to explore and analyze the assessment practices of secondary school mathematics teachers and the conceptions they underlie. The study was conducted from a systemic perspective. We therefore targeted three aspects in our study: the conceptual, the institutional, and the docimological. Analysis of the attitudes declared by a random sample of mathematics teachers enabled us to confirm that pedagogical, and in particular cognitive, issues do not represent a priority for them in assessment practices. They focus more on the organizational aspect of examinations, with a remarkable lack of concern for docimological considerations to give credibility to the assessments carried out.

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1. INTRODUCTION

Classroom' activities are mainly articulated around preparing teaching sessions, managing their progress in the classroom, and assessing students' learning, as reported in [1]. According to Giraudeau [2], this last one is an important part of teaching and learning processes, since it enables the teacher to make a judgment, which is in itself essential for him or her to readjust learning in progress if necessary, or to authorize the next step. So, its practice in the classroom should be efficient.

Clanet and Talbot [3] consider that in practice, teachers act in several ways. In particular, teachers' own representations and values can influence their approach to assessment. With this regard, their representations are shaped by a complex interplay of various factors, including personal, historical, cultural, and social contexts. These contexts play a crucial role in forming teacher's identity and in development of his teaching practices, including the approaches in assessment.

In social-cognitive theory, and referring to the reciprocal triadic model proposed by Bandura [4], Carré [5] stated that human activities, including teacher evaluation practices, are the result of the interaction between three factors: individual's personal characteristics, his behaviors and the environment in which he evolves. This leads Roditi [1] to deduce that to study and perceive evaluation practices, we need to explore the three dimensions: personal, institutional, and social. Personal dimension is related to their conceptions, experiences, and personal relationships to the teaching subject. Institutional dimension concerns what is set by official institutions, i.e., the prescriptions that direct their activities; while social dimension concerns the norms required by the context in which the teachers work. These dimensions influence teachers' development of

producing evaluative documents, making these documents closely linked to teachers' representations of assessment and learning and to their knowledge in disciplinary, didactic, and professional fields.

Representations that teachers have influence not only the way in which evaluation documents are drawn up, but also their numerical judgements of competences, which are made through the awarding of marks; marking is perceived, moreover, as an institutional and public statement of a judgement. Several research studies [6], [7] attribute this misunderstanding of evaluation to a lack of basic knowledge of measurement and evaluation. According to Legendre [8], the model chosen is what causes variations in evaluation procedures. He calls for a change from the teaching paradigm to the learning paradigm as a result. This adjustment requires the development of new evaluation abilities, such as the preparation of a test specifications table that determines the objectives and contents to be assessed and setting up optimal conditions to maximize student performance.

Given the problematic aspect of learning assessment, several authors have contributed to the emergence of a new field of research, or more precisely, a science of examinations. It aimed in particular at determining the statistical reliability of assessments of academic skills. This science, as explained in [9], has shown the intrinsic uncertainty of all numerical evaluations of skills and the existence of many factors behind biases in evaluation and correction. De Landsheere [10] pointed out that these biases detract from the non-objectivity of the teacher's evaluative act. Docimology has taken on the task of mitigating these biases, through studying examinations, marking systems, and the behavior of examiners and examinees.

In internal examinations, Leclercq *et al.* [11] consider that teachers' freedom within the classroom is almost total. They are the responsible on administering the tests, choosing the subject, the questions, their form, timing and duration, and their impact on the final mark. According to Merle [12], this influences their practices in the act of evaluation, and subsequently links evaluation with "processes and procedures at the crossroads of social constraints and the biographies of pupils and teachers". As a result, several biases in evaluation may appear. Teachers bring their own experiences and perspectives into classroom. This can influence their beliefs about what constitutes effective assessment and how it should be implemented.

The review above leads to the conclusion that it is essential to consider the various contexts in which teachers work in order to better understand their assessment conceptions and practices. Indeed, a variety of institutional, societal, and individual factors contribute to conceptions and practices. In other words, an in-depth study in this area requires a systemic approach. Indeed, thinking about assessment means questioning the development of processes to validly assess mathematical competence in all its complexity, taking into account the requirements of educational policy, which sometimes have a societal dimension, such as equity and transparency.

The main target of this paper is to identify the evaluative logic that drives teachers in assessment learning mathematics activities according to personal, institutional, and social dimensions. We focus on the practices deployed by teachers in classroom assessment situations. Thus, we explore the way in which they conceive tests they offer to their students and how they practice them in their classrooms, as well as the grading they adopt.

This study aims to investigate conceptions and practices of mathematics teachers in secondary school related to assessment of learning mathematics. According to this, the principal questions can be formulated as follows:

a. How do mathematics teachers perceive the learning assessment acts?
b. What are the principal factors taken into account by mathematics teachers in their learning assessment practices?

With these questions in mind, we can formulate the following hypotheses.

a. Hypothesis1: mathematics teachers are aware of the different roles of diagnostic and formative assessments.
b. Hypothesis2: the assessment practices of mathematics teachers are influenced by factors, due in particular to their own conceptions, which generate certain biases.

To provide the necessary answers to our questions, we begin by drawing up a conceptual framework for this study, which will enable us to set up a methodological protocol for collecting the required data from mathematics teachers. The information gathered will then be analyzed to draw the appropriate conclusions.

2. CONCEPTUAL FRAMEWORK

One way to frame our study might be to begin by clarifying what is meant by some concepts which will be used in this study. Then, to identify a framework for analysis that is a result of various approaches that have already contributed to a set of theorizing. These approaches include teacher thinking paradigm, the study of the relationship between representations and practices, cognitive ergonomics for the detailed analysis of teachers' activities in relation to those of students, process-product models in the sense developed by Bru [13], as well as the contributions of research into evaluative practices in mathematics. These theorizations, from

various perspectives, constitute points of support in the analysis of teaching practices, as well as their conditions and constraints of realization.

In exploring the literature on teacher beliefs, several terms have been used to refer to this concept. For example Harootunian and Yarger [14] used ‘subjectively reasonable beliefs of teachers’, Clark and Peterson [15] used the term ‘implicit theories’, Calderhead [16] used the term ‘untested assumptions’ while Thompson [17] invoked the notion of a "belief system" to study conceptions as a comprehensive system of ideas, interactions, and actions. Both authors Thompson [17] and Brown [18] used the term "conceptions" rather than "beliefs" in their research. Thompson [17] considers that conceptions reflect a more general mental structure, encompassing beliefs, meanings, concepts, propositions, rules, mental images, preferences and the like.

Pratt [19] sees conceptions as ideas or categories of ideas that the teacher has and are related to how his or her teaching is put into practice. According to the same author [19], beliefs are an environmental and cultural lens through which events, people and interactions are perceived. It is also important to mention research into teachers' conceptions of assessment, as these conceptions guide their assessment practices, both in the implementation phase of classroom assessments and in preparing students for external examinations. Research and theories, as in [20], [21] for instance, have shown that the beliefs that teachers hold about their profession influence their engagement in their work. In the context of assessment, teachers' beliefs about the purposes of assessment can influence how they implement it, as well as the decisions they make.

The existence of two approaches to formative assessment, data-based decision making and assessment for learning, entrusts assessment with two main categories of objectives: social and pedagogical, as Van der Kleij *et al.* [22] reveal. The first one is closely linked to the social role of the school and is marked by a perspective of selective and excluding classification in order to certify a success or a failure, and therefore it gives more importance to memorization and contents. In this context, Almeida *et al.* [23] consider that assessment examines knowledge in a bureaucratic and superficial way, aiming at an end result and not effective and procedural learning. For the second category, many studies, such as [24] and the refrences therein, consider that assessments contribute improving learning if instructional activities and teaching methods are adjusted to match the pace of students' progress.

Despite the recognition of formative assessment as the ideal way to enhance student learning, the reality is still marked by the persistence of a perspective of classification, certification and naturalization through the use of examinations. Roditi [1] argues that teachers' ideas and experiences are present in course design and in the assessments they propose. These ideas lead them to anticipate on the assessment that they will propose according to the difficulties that their students have encountered, and also according to the message that they wish to send to their classes when they return the copies. In other words, their conceptions guide their practices.

By a practice, Guigue [25] refers to a fact which occupies time and space, aims at an effect, produces an object (learning, knowledge) and a subject-object (a student who receives this knowledge, undergoes this learning). Whereas, Barbier [26] indicates that the practice is a process of transformation of a reality into another one. Other researchers, as mentioned by Guigue [25], put the accent on the praxis, borrowed from the marxist vocabulary, is specified by the material activity by which one can transform the environment and the material relations they establish between themselves collectively. With this sense, praxis refers rather to tangible actions of individuals as they reshape their environment and establish community ties.

Dissonance theory stipulates, as described by Festinger [27], that individuals seek to maintain consistency between their various cognitions, beliefs, and behaviors. According to Guerra and Wubbena [28], this theory also states that when there is inconsistency between beliefs and behaviors, individuals engage in modifying their beliefs and/or behaviors in order to make them consistent and achieve cognitive coherence. De Landsheere [10] pointed out that in a school situation, the teacher knows each of his or her students and can therefore adapt his or her markings according to the desired effect. The interaction between the examiner and the student or the document being graded can lead to a number of biases. Some of these are briefly recalled below.

a. Stereotype effect: for Leclercq *et al.* [11] students' previous results influence the assessor in subsequent assessments, creating a kind of imitation of results by contagion. De Landsheere [10] states that a first piece of work of mediocre quality may lead to the assumption that the next will also be of mediocre quality.
b. Halo effect: in this type of effect, the mark is influenced by student's characteristics, such as the presentation of the copy and handwriting in the case of written assessments. For example, Marshall showed separately with Scannell [29], and then with Powers [30], that poor writing quality leads to lower results than good writing quality, even if the content of the two essays is identical.
c. Contrast or sequence effects: the interaction between successive papers can identify undesirable effects on the judgment made of these papers, with an average paper likely to be disadvantaged after a brilliant paper or advantaged after a poor paper.

d. The instability of a single grader: Leclercq *et al.* [11] consider that there are some internal variables to the marker, such as fatigue, momentary distraction, or chance, which means that the same marker can, at different times, give different marks to the same copy. In an experiment, Howard *et al.* [31] demonstrated the infidelity of marking by the same marker at different times.
e. The backlash effect: it refers to the phenomenon where teachers adjust their teaching method and content in response to the changing demands of external examinations.

3. METHODOLOGY

As stated before, the main target of this study is to explore the effect of conceptual, institutional, and social factors on the practices of mathematics' teachers in assessing mathematics learning. Based on the conceptual frame drawn previously, these three aspects can be implemented in developing the questionnaire by considering the following description. Conceptual aspect concerns the way in which mathematics' teachers see the purpose of diagnostic and formative assessments, as well as how they perceive evaluative acts (preparation of evaluative documents, setting examinations, and marking exam papers). Institutional aspect deals with teachers' practices with respect to official guidelines. The question of objectivity in the preparation of the tests and the methods used to ensure that all candidates take the tests under the same conditions is also addressed in this second aspect. In the social aspect, the emphasis is placed on possible forms of pressure from society, school management, parents of students or their teaching colleagues that may have an impact on the evaluation practices of mathematics teachers.

To undertake exploration of mathematics teachers' conceptions and practices regarding assessment, we chose to conduct a survey via a questionnaire as shown in Table 1, distributed online to promote an environment where the teachers questioned feel free to produce their own answers. In addition to the anonymity guaranteed by this choice, the respondent has the possibility of choosing the time and place where he wishes to complete the questionnaire. This is an important condition for increasing the number of participants. Another significant advantage of using a questionnaire is that it allows a wide range of information to be collected, both factual and subjective. In addition, it offers the possibility of quantifying the data obtained, which can then be used statistically.

3.1. Development of the questionnaire

During the development of the questionnaire in Table 1, the order of the questions was placed in such a way as not to influence the respondents and to limit the effects of fatigue and contamination. The latter type concerns the direct influence of one question on the answer to the following ones. The questions asked are therefore closed, dichotomous (yes/no) or three-choices (yes/no/sometimes). The questions have been designed according to the criterion of objectivity emphasized by Poisson [32] which means that the questions must be formulated in such a way as to ensure that the researcher does not reflect his own opinions or values. The designer of the survey will therefore have to develop a questionnaire that is as neutral as possible.

To verify the validity of the questionnaire, we first presented it to three experts in the evaluation field, and then we administered it to 10 mathematics teachers, randomly chosen from volunteers and outside the study sample, in order to collect all possible remarks on the formulation of the questions and if the intended meaning can be clearly grasped by the respondent. As a result, some minor adjustments were made to certain questions. We also tried to reduce all the causes that can generate social biases, as recommended by Nankervis *et al.* [33] by guaranteeing the anonymity of the participants and allowing them to voluntarily participate in answering the questionnaire.

Our exploration of assessment conceptions and practices will be based on the statements made by the teachers surveyed on three aspects described previously. The first is conceptual and concerns the identification of their conceptions of assessment; the second is institutional and aims to describe their attitudes to official texts framing the assessment of learning. The official guidelines [34] for the assessment of mathematical learning in Moroccan secondary school call for the preparation of a reference frame in the form of an outline describing the mathematical skills and knowledge to be covered by formative or summative assessments, as well as the proportion of each topic in the examination. The last aspect is docimological, and is intended to explore the place of taking into account the impact of the effects of docimology in the assessment process. In Table 2, we present the distribution of the questionnaire questions according to the three aspects.

Through questions Q2 to Q7 of the questionnaire, we seek to explore the different conceptions that mathematics teachers may have on the assessment of learning. This first series of questions also aims to determine whether teachers are sufficiently aware of the importance of educational issues in the practice of evaluation. Questions Q8 to Q13 of the questionnaire are devoted to the description of evaluation practices. In particular, knowing how the requirements stipulated by the institutional framework are implemented in classrooms is also targeted. Thus, these items question teachers about the methods they use in the evaluation

process. Items Q14 to Q19 of the questionnaire attempt to explore whether mathematics teachers are aware of the need to take the necessary measures to practically avoid sources of bias in learning assessments.

Table 1. Questionnaire

Q1: How long have you been a secondary school teacher?		Less than 5 years	Between 5 years and 10 years	More than 10 years
Q2: How do you see the purpose of school assessments?	Act that helps students in their learning process	Yes	No	-
	Act of judging and grading achievement	Yes	No	-
Q3: Do you think you can assess all learning in a single test?		Yes	No	-
Q4: Do you think diagnostic assessment is useful for students before they begin new learning?		Yes	No	-
Q5: Do you think that the assessment should be in line with the new teaching methods?		Yes	No	-
Q6: Do you think that it is necessary to take into account student's learning level in assessment?		Yes	No	Some times
Q7: Do you think that the formulation of a question has an impact on student performance?		Yes	No	-
Q8: Do you prepare a specifications table before designing the test items?		Yes	No	-
Q9: Do you organize a diagnostic test for your students at the beginning of a new lesson?		Yes	No	-
Q10: Do you regularly correct your students' homework?		Yes	No	-
Q11: Do your students complete their tests on time?		Yes	No	Some times
Q12: Do your students complain about the length of the tests that you organize for them in class?		Yes	No	Some times
Q13: Do you adapt your exams to the levels of your students?		Yes	No	Some times
Q14: Do you take into account the presentation of your students' work when grading?		Yes	No	-
Q15: Do you take into account students' profiles (classroom behavior, grade repetition) when assessing their work in exams?		Yes	No	-
Q16: When grading copies, do you feel influenced by copies already marked?		Yes	No	-
Q17: Do you grade all exam papers from the same class under the same conditions?		Yes	No	-
Q18: If scores are too high or too low, do you readjust the grading scale?		Yes	No	Some times
Q19: Do you feel influenced by public opinion, school management or parents to assign good marks?		Yes	No	-

Note: Q is question

Table 2. Analysis indicators

Aspects	Related items
Aspect 1	Q2, Q3, Q4, Q5, Q6, Q7
Aspect 2	Q8, Q9, Q10, Q11, Q12, Q13,
Aspect 3	Q14, Q15, Q16, Q17, Q18, Q19

3.2. Participants

The study targeted secondary school teachers of mathematics at the twelve regional academies of education and training in Morocco. All participants who volunteered to participate in the study, carried out in May 2023, were informed that their contribution was part of an academic research, and that their answers would be used exclusively for this purpose. Table 3 shows the distribution of teachers surveyed according to their seniority in teaching.

Table 3. Professional experience

	Frequency	Percent (%)
Less than 5 years	105	50
Between 5 and 10 years	65	31
More than 10 years	40	19
Total	210	100

Half of the teachers (50%) surveyed have less than 5 years' professional experience, while those between 5 years' and 10 years' experience represent 31% of the population surveyed, followed by teachers with more than 10 years' experience (19%). This formation of the sample seems to us quite natural, given that the teaching staff has been experiencing a massive change since 2016, which has affected more than 60% of the total number of teachers.

3.3. Data analysis

Given the nature of our questionnaire's variables, which are all qualitative with dual or triple modalities, multiple correspondence analysis (MCA) seems to us to be the appropriate tool for analyzing and interpreting the participants' responses with regard to the links between various modalities. Statistical analysis is carried out using SPSS software. First, a descriptive analysis is performed to give a general overview of the responses collected from the teachers. This was followed by a correlation analysis. This quantitative study will be then followed by a qualitative analysis, taking into account the literature review carried out in this paper.

4. RESULTS AND DISCUSSION

4.1. Results

In this section, we restrict ourselves to reporting the quantitative results of the statistical analysis we have carried out. The univariate analysis of the answers obtained gave the results summarized in Table 4. For question Q2, 61% said that assessment is an act that helps students in their learning process, while the rest saw it as an act of judging and grading success. From these initial results, a number of conclusions can be drawn. Nevertheless, to bring more credibility to this study, it is necessary to carry out a cross-study between the variables in terms of correlation. This task has been undertaken by carrying out the MCA.

Table 4. Univariate results

	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19
Yes	154	138	137	63	196	154	196	83	7	31	130	192	118	125	62	67	49
No	56	72	73	11	14	56	14	42	90	59	80	18	92	85	45	143	161
Some times	-	-	-	136	-	-	-	85	113	120	-	-	-	-	103	-	-

The first result to which attention should be paid is Cronbach's Alpha [35], which indicates the internal consistency of the questionnaire. The mean value obtained is 0.787. We can therefore consider that our questionnaire is reliable since the value obtained is greater than or equal to 0.7 [36]. The correlations obtained are presented in Table 5 (in Appendix)

A first remark to retain from these results is that there is no pair of variables whose correlation is zero. This confirms the relevance of our questionnaire as a tool for exploring the conceptions of mathematics teachers on evaluation. The MCA carried out revealed that it is possible to retain two main dimensions, Dimension 1 and dimension 2, which have the respective alpha Cronbach values 0.831 and 0.721. Figure 1 shows the representation of the different variables in the factorial plane formed by the two dimensions 1 and 2. The representation of the different variables with respect to the two dimensions is illustrated in Figure 2. The representation of individuals in the plane formed by the two main dimensions resulting from MCA is provided in Figure 3.

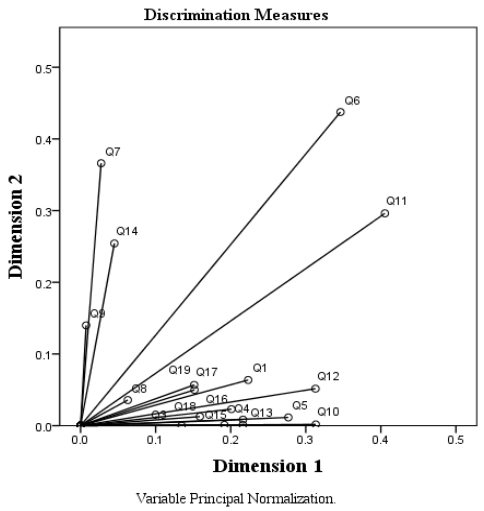

Figure 1. Discrimination measures

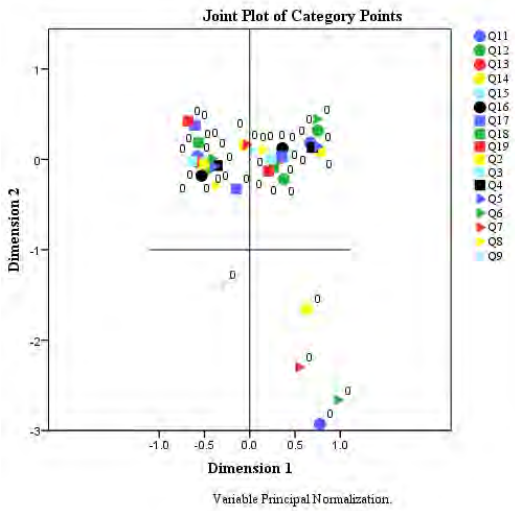

Figure 2. Representation of variables

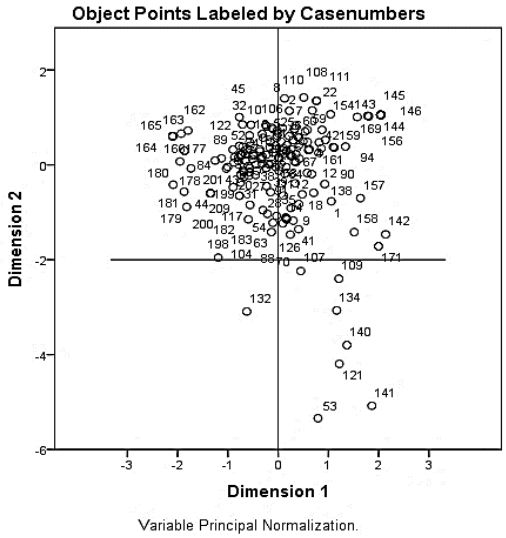

Figure 3. Representation of subjects

4.2. Discussion

The first result to comment on is the relatively high proportion of mathematics teachers who consider that the act of assessment has the function of judging students and grading success, whereas they have been offered an alternative response of a pedagogical nature. Furthermore, it should be noted that this attitude is slightly positively correlated with seniority (r = 0.165). Statstically, this means that as the number of years of practice increases, the attitude towards the function of learning assessment tends more towards social objectives, including institutional ones. It should also be noted that the answers given to question Q2 are coherent with those obtained for question Q4, which asks whether diagnostic assessment is useful for students before they begin new learning. This coherence can be justified by their almost identical proportions, and also by the significant positive correlation between these two variables (r = 0.409).

This last point is also valid when we compare the answers to question Q2 with those declared by teachers on questions Q5 and Q6, according to which a significant part of the survey population does not agree with the facts that assessment should be in line with the new teaching methods or that it is necessary to take into account student's learning level in assessment. For the last question Q7 dealing with the conceptual aspect, the majority of teachers see that the formulation of a question has an impact on surdents' performances. However, this attitude is only weakly correlated with those declared on the questions related to this first aspect in our exploration.

Concerning the institutional aspect, the first question Q8 revealed that 73.3% of teachers prepare a specifications table before designing the test items, as recommended by the official pedagogical guidelines for teaching mathematics in Morocco. It is this framework that makes it possible to define the objectives and assessment tools in terms of the knowledge and skills targeted and the test items adapted to their implementation. So, theoretically at least, we should expect consistency in the answers to questions Q3 and Q8. This is not the case in the answers collected, and there is very weak negative correlation. This inconsistency also applies to attitudes towards diagnostic evaluation at the conceptual and institutional levels covered by questions Q4 and Q9 respectively. To this, we add that the positions expressed for diagnostic evaluation are weakly correlated with the majority of the variables evoked in our questionnaire, and more clearly with those linked to the institutional aspect, which reflect classroom evaluation practices. Another result in line with our declared attitudes can be found in the answers to question Q10. Indeed, although homework represents a good opportunity for formative assessment and, above all, self-assessment, it turns out that an unsatisfactory proportion of teachers correct their pupils' work with the aim of using the results of this correction to monitor learning progress. In a seemingly contradictory way, the answers given to question Q13 are weakly correlated with the positions expressed concerning the various variables of the institutional aspect. This correlation is even negative with the position on the practice of diagnostic assessment.

Another essential point for the success of summative assessment is the time allowed for classroom tests. The number of teachers who do not say that the time they allow for exams is sufficient for students to finish the required achievements is too low. On the other hand, the rate of those who confirmed that it is not enough is almost 43%. In addition, 57% of teachers replied that their students sometimes complain that the

time allowed for exams is too short, and around 15% confirmed these complains. The answers to questions Q11 and Q12 also show a statistically significant positive correlation.

Questions exploring attitudes towards docimological considerations revealed firstly that just 62% of teachers responding to the questionnaire take into account the presentation of their students' work when grading, and the remainder do not. By the presentation of students' work, we mean both the organizational aspect and all that relates to mathematical skills. Referring to the results of the Table 4, we can clearly see the weak correlation of this variable with all the others targeted by the exploration of conceptions and practices within the docimological framework.

Responses to question Q15, which was intended to explore awareness of the Halo effect, showed that 56% of teachers take into account students' profiles when assessing their work in exams, and 59.5% feel influenced by copies already marked. The latter result reveals that the impact of the Stereotype effect on the reliability of assessments is not well considered by a significant proportion of the teachers surveyed. Question Q17 aims to determine whether teachers are sufficiently conscious of the biases that can result from the effects of contrast and instability. On this question, only 29.5% of teachers confirmed that they grade all exam papers from the same class under the same conditions.

As already mentioned, the act of assessing learning is part of a socio-educational context that can influence teachers' behavior. Q18 and Q19 aim to describe this in terms of attitudes and practices. When it came to adjusting marking scales after discovering that pupils had not performed satisfactorily, 68% of teachers answered negatively, and almost 77% said they did not feel influenced by public opinion, school management or parents to assign good marks. It should also be noted that the latter declared attitude correlates very weakly with seniority in the profession. In order to make more comprehensible the different attitudes of mathematics teachers towards the assessment of learning as described in the preceding paragraphs, it is necessary to identify from the MCA carried out the main dimensions underlying these attitudes.

For this effect, we need to start by identifying each of the two dimensions resulting from MCA. Figure 1 shows that the variables illustrated by questions Q11, Q10, and Q12 are best represented in an ordered way in relation to the first dimension. The first significant observation is that the three variables characterizing the first dimension are of an institutional type. It should also be noted that questions Q11 and Q12 both deal with the organizational side of classroom examinations. In the case of question Q10, it is important to mention that it concerns the strictly pedagogical functions of assessment. The second dimension deduced from the MCA is fairly well characterized by the variables formulated in questions Q6 and Q7, which relate to the conceptual aspect. These two variables are positively associated. We understand this connection by the fact that being convinced that the formulation of exam questions has an impact on students' performance is part of taking into account their level in formulating test items.

Referring to these two dimensions, Figure 2 shows that the first dimension marks an opposition between the variables evoked in questions Q2 to Q19. This opposition means that the modalities retained in the teachers' responses are not uniform. On the other hand, there is an almost total domination of the positive representation of the different modalities of the variables in relation to the second dimension. This description also extends to the representation of teachers in the plan formed by the two dimensions. The first dimension classifies the survey population in two. Figure 3 shows that the first category of teachers is represented by those who project positively on the first axis, and the second by those who project negatively. These are two groups of teachers who have declared opposite modalities with regard to the institutional aspect. This opposition is no longer true for dimension 2. With the exception of a few specific individuals, most of the teachers are positively associated with dimension 2.

It is also worth noting that there is a high degree of proximity between the majority of individuals in the plan. This means that these teachers have the same response profiles. In other words, the teachers share the same conceptions of learning assessment, but have institutionally opposed practices.

5. CONCLUSION

The importance of assessment in the learning process is uncontested. This can be deduced from the abundant literature on the subject. However, the practice of this multi-faceted pedagogical act remains unsatisfactory. This is due to a number of factors, divided between the conceptual and the institutional, including societal factors. One of the fields developed with the aim of better understanding and consequently promoting learning assessment practices is docimology. The present work is part of this research theme. The main aim is to contribute to the exploration of mathematics teachers' assessment practices, in order to gain a deeper understanding of the main factors that characterize them.

To achieve this objective, we chose to survey secondary school mathematics teachers. The questionnaire items covered the three aspects identified in our literature review: conceptual, institutional, and docimological. Analysis of the results obtained revealed several particular attitudes in the teachers'

declarations, starting with the weak correlation of seniority with all the other variables involved in the questionnaire. In principle, increasing years of work should lead to a more reflective practice. For the cases studied, the contrary is true. We think this is an interesting point to investigate in future research.

On the conceptual side, we found that a significant proportion of teachers do not see that assessment helps students in their learning process. This position correlates with all the other variables. In particular, it correlates with the stated positions on the importance of diagnostic and formative assessments and the formulation of test items. On the institutional issue, a contradiction was observed in the teachers' declarations, especially when it came to setting up the protocols needed to monitor student learning, such as the practice of diagnostic assessment or the preparation of a guide to properly frame the formative assessments practiced mainly in the form of homework and summative assessment. On the docimological aspect, it was clear that the teachers surveyed do not take into account the docimological measures needed to ensure the reliability of the assessments they carry out.

To better understand teachers' conceptions and describe their practices, we opted for a MCA. This gave rise to two main dimensions. The first has an institutional character. More precisely, it is the organizational considerations of summative examinations that explain the great variability in the modalities expressed by teachers. This is in line with the fact that assessment is reduced to a task that examines knowledge in a bureaucratic and superficial way or a task that encourages the memorization of content. The second dimension deriving from MCA is characterized by conceptual variables related to teachers' preoccupation with their students' performance in examinations.

Finally, in response to the questions posed in this study, we can deduce that for the first question, mathematics teachers do not display attitudes to the assessment of learning in which pedagogical considerations take priority. Assessment, in all its forms, is not seen as a key lever for developing students' mathematical skills. Consequently, the first hypothesis formulated in the introduction to this paper proves to be erroneous. On the other hand, the second hypothesis has been confirmed. Our study showed that the assessment practices of mathematics teachers are influenced by factors which generate certain biases. These factors mainly revolve around a lack of awareness of docimological considerations and an exaggerated preoccupation for the institutional aspects of assessment practices. At the end of this work, and with a view to broadening the scope of this study, we propose to carry out a further study on the practice of learning assessment in relation to disciplinary content in the different areas of mathematics taught in secondary school.

APPENDIX

Table 5. Correlations between variables

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19
Q1	1																		
Q2	0.165	1																	
Q3	0.201	0.262	1																
Q4	0.220	0.409	0.209	1															
Q5	0.178	0.379	0.169	0.231	1														
Q6	0.185	0.250	0.107	0.241	0.298	1													
Q7	0.003	0.021	-0.012	-0.032	-0.035	0.105	1												
Q8	0.077	0.063	-0.096	-0.018	0.101	0.120	0.032	1											
Q9	0.153	0.018	0.012	-0.129	0.075	-0.051	-0.082	0.098	1										
Q10	0.147	0.293	-0.007	0.086	0.175	0.318	0.130	0.150	0.083	1									
Q11	0.218	0.295	0.213	0.216	0.285	0.401	0.101	0.126	0.013	0.311	1								
Q12	0.281	0.268	0.159	0.273	0.266	0.335	0.001	0.221	-0.014	0.354	0.376	1							

Table 5. Correlations between variables (*continue*)

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19
Q13	0.048	0.034	0.031	0.030	0.169	0.078	0.259	0.108	-0.055	0.061	0.129	0.010	1						
Q14	0.232	0.206	0.347	0.153	0.099	0.203	0.052	0.037	0.105	0.255	0.254	0.059	0.065	1					
Q15	0.138	0.254	0.119	0.153	0.080	0.194	0.044	0.140	0.072	0.176	0.128	0.110	0.137	0.065	1				
Q16	0.123	0.183	0.139	0.146	0.296	0.107	-0.013	0.051	0.207	0.135	0.140	0.070	0.152	0.010	0.445	1			
Q17	0.154	0.178	0.008	0.104	0.163	0.045	0.074	-0.018	-0.003	0.233	0.120	0.137	0.162	0.086	0.150	0.192	1		
Q18	0.128	0.171	0.072	0.193	0.178	0.201	0.142	0.095	-0.060	0.197	0.164	0.060	-0.011	0.100	0.137	0.164	0.172	1	
Q19	0.038	0.165	0.126	0.114	0.048	0.082	0.147	0.100	-0.012	0.196	0.197	0.073	0.240	0.048	0.126	0.164	0.288	0.178	1

REFERENCES

[1] É. Roditi, "A theoretical orientation for the analysis of teaching practices in mathematics didactics," (in French) *Recherches en didactiques*, vol. 15, no. 1, Art. no. 1, Mar. 2013, doi: 10.3917/rdid.015.0039.

[2] C. Giraudeau, *School grading: the contribution of psychology (in French)*, In C. Giraudeau&G. Chasseigne, Psychologie. Paris: Editions Publibook Université, 2015.

[3] J. Clanet and L. Talbot, "Analysis of teaching practices: Theoretical and methodological frameworks," (in French) *Phronesis*, vol. 1, no. 3, Art. no. 3, Oct. 2012, doi: 10.7202/1012560ar.

[4] A. Bandura, *Self-efficacy: the exercise of control*. in Self-efficacy: The exercise of control. New York, NY, US: W H Freeman/Times Books/ Henry Holt & Co, 1997, pp. ix, 604.

[5] P. Carré, "Bandura: a psychology for the twenty-first century?," (in French) *Savoirs*, vol. Hors série, no. 5, Art. no. 5, Dec. 2004, doi: 10.3917/savo.hs01.0009.

[6] É. Dionne, "Learning assessment issues in competency-based curricula: the example of science and technology," (in French) *Mesure et évaluation en éducation*, vol. 28, no. 2, Art. no. 2, 2005, doi: 10.7202/1087224ar.

[7] M. Ngunjiri, "The role of assessment in mathematics classrooms: a review," *International Journal of Advanced Research*, vol. 5, no. 1, Art. no. 1, Oct. 2022, doi: 10.37284/ijar.5.1.887.

[8] M.-F. Legendre, "Encourage changes in the way learning is assessed," (in French) *Vie pédagogique*, vol. 120, pp. 15–19, 2001.

[9] P. Merle, *School assessment practices. History, difficulties, prospects*, (in French) Paris: PUF, 2018.

[10] G. de Landsheere, *Continuous assessment and examinations: a precis of docimology*, (in French) Bruxelles, Belgium: Labor/Fernand Nathan, 1971.

[11] D. Leclercq, J. Nicaise, and M. Demeuse, "Docimologie critique: The difficulties of marking papers and awarding marks to students," (in French) in *Introduction aux théories et aux méthodes de la mesure en sciences psychologiques et en sciences de l'éducation*, M. Demeuse, Ed., Les éditions de l'Université de Liège, 2004, pp. 273–292.

[12] P. Merle, *Student assessment: a survey of teachers' judgement*, (in French) 1re éd. in L'éducateur. Paris: Presses universitaires de France, 1996.

[13] M. Bru, "Studying teaching practices: the reasons for a choice. Presentation (in French)," *Les Dossiers des Sciences de l'Éducation*, vol. 5, no. 1, Art. no. 1, 2001.

[14] B. Harootunian and G. P. Yarger, "Teachers' conceptions of their own success. Current issues," ERIC Clearinghouse on Teacher Education, 1 Dupont Circle, Suite 610, N, Feb. 1981.

[15] C. M. Clark and P. L. Peterson, "Teachers' thought processes. Occasional paper no. 72," Institute for Research on Teaching, College of Education, Michigan State University, 252 Erickson Hall, East Lansing, MI 48824, ($13, May 1984.

[16] J. Calderhead, "Teachers: beliefs and knowledge," in *Handbook of educational psychology*, London, England: Prentice Hall International, 1996, pp. 709–725.

[17] A. G. Thompson, "Teachers' beliefs and conceptions: A synthesis of the research," in *Handbook of research on mathematics teaching and learning: A project of the National Council of Teachers of Mathematics*, New York, NY, England: Macmillan Publishing Co, Inc, 1992, pp. 127–146.

[18] G. T. L. Brown, "Teachers' conceptions of assessment: implications for policy and professional development," *Assessment in Education: Principles, Policy & Practice*, vol. 11, no. 3, Art. no. 3, Sep. 2004, doi: 10.1080/0969594042000304609.

[19] D. D. Pratt, "Conceptions of teaching," *Adult Education Quarterly*, vol. 42, no. 4, Art. no. 4, Jun. 1992, doi: 10.1177/074171369204200401.

[20] N. Barnes, H. Fives, and C. M. Dacey, "Teachers' beliefs about assessment," in *International handbook of research on teachers' beliefs*, Montclair State University, US, 2015, pp. 284–300.

[21] H. Fives and M. M. Buehl, "Spring cleaning for the 'messy' construct of teachers' beliefs: What are they? Which have been examined? What can they tell us?," in *APA educational psychology handbook, Vol 2: Individual differences and cultural and contextual factors*, in APA handbooks in psychology®. Washington, DC, US: American Psychological Association, 2012, pp. 471–499, doi: 10.1037/13274-019.

[22] F. M. Van der Kleij, R. C. W. Feskens, and T. J. H. M. Eggen, "Effects of feedback in a computer-based learning environment on students' learning outcomes: a meta-analysis," *Review of Educational Research*, vol. 85, no. 4, Art. no. 4, Dec. 2015, doi: 10.3102/0034654314564881.

[23] A. B. de Almeida, R. P. da R. Rosistolato, and D. G. da S. Cerdeira, "Conceptions and assessment practices in Rio de Janeiro municipal schools," *Ensaio: Avaliação e Políticas Públicas em Educação*, Mar. 2022, doi: 10.1590/s0104-40362022003003593.
[24] D. Fernandes, "Towards a theory of assessment in the field of learning," (in French) *Estudos em Avaliação Educacional*, vol. 19, no. 41, Art. no. 41, Dec. 2008, doi: 10.18222/eae194120082065.
[25] M. Guigue, "Around the word practice (in French)," *Recherche et Formation, les savoirs de la pratique, un enjeu pour la recherche et la formation*, vol. 27, pp. 115–122, 1998.
[26] J.-M. Barbier, *Theoretical knowledge and knowledge of action*, (in French) in Education et formation. Presses Universitaires de France, 2011.
[27] L. Festinger, *A theory of cognitive dissonance*. in A theory of cognitive dissonance. Stanford University Press, 1957, pp. xi, 291.
[28] P. L. Guerra and Z. C. Wubbena, "Teacher beliefs and classroom practices cognitive dissonance in high stakes test-influenced environments.," *Issues in Teacher Education*, Apr. 2017.
[29] D. P. Scannell and J. C. Marshall, "The effect of selected composition errors on grades assigned to essay examinations," *American Educational Research Journal*, vol. 3, no. 2, Art. no. 2, 1966.
[30] J. C. Marshall and J. M. Powers, "Writing neatness, composition errors, and essay grades," *Journal of Educational Measurement*, vol. 6, no. 2, Art. no. 2, Jun. 1969, doi: 10.1111/j.1745-3984.1969.tb00665.x.
[31] B. Howard, P. Hartog, and E. Rhodes, "An examination of examinations," *Nature*, vol. 136, no. 3451, Art. no. 3451, Dec. 1935, doi: 10.1038/136966a0.
[32] Y. Poisson, *Qualitative research in education*, (in French) 1st ed. Presses de l'Université du Québec, 1991, doi: 10.2307/j.ctv18pgjnq.
[33] A. Nankervis, C. Rowley, and N. M. Salleh, *Asia pacific human resource management and organisational effectiveness: impacts on practice*. Oxford: Chandos Publishing, 2016, doi: 10.1016/C2014-0-04366-3.
[34] MNE, "Assessment of mathematics learning in qualifying secondary schools," (in Arabic) *National Assessment and Examination Center, Ministry* of National Education, 2007. [Online]. Avalilable: https://www.crmefk.ma/wp-content/uploads/2023/12/Circulaire-Ministerielle-N%C2%B0142-08.-LEvaluation-en-Mathematiques-au-Cycle-Secondaire-Qualifiant.pdf.
[35] L. J. Cronbach, "Coefficient alpha and the internal structure of tests," Psychometrika, vol. 16, no. 3, pp. 297–334, Sep. 1951, doi: 10.1007/BF02310555.
[36] K. S. Taber, "The use of cronbach's alpha when developing and reporting research instruments in science education," Research in Science Education, vol. 48, no. 6, pp. 1273–1296, Dec. 2018, doi: 10.1007/s11165-016-9602-2.

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