

Docimological Study of the Test of the Entrance Examination to the CRMEF of the Graduate Professors Qualifying Option Physical Chemistry Session 2015-2016 and Determining Factors in the Choice of Good Future Teacher

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Abstract – The Regional Centers of Education and Training (C.R.M.E.F) in Morocco are responsible for recruiting and training candidates for the teaching of schools. The recruitment of future teachers is based on the overall score obtained by candidates for the written and oral competition in the specialty subject. The written examination, in the form of a multiple-choice questionnaire (MCQ), accompanied by a correction scale is drawn up by the National Examination Center of the Ministry of National Education and Vocational Training (M.E.N.F.P). The evaluation of the examination according to the predetermined scale is done by the teacher trainers of the CRMEF. This study focuses on multi-choice questionnaire certification (MCQ). It concentrates exclusively on the one hand to analyze the score obtained by each candidate in examination MCQ taking into account the predetermined scale (experimental) and compare it to that obtained using another scale (theoretical) and on the other hand see which of the two rating scales is decisive in choosing a good future teacher. It also aims to understand the effects of penalizing wrong answers in relation to the pass rate of an exam. In order to do this, a comparative study was made between the predetermined rating scale (given by the examination center: experimental) and this given by the theoretical rating scale.

The result of this study reveals that an examination that uses a more severe penalty scale does not discriminate between candidates and does not allow an adequate choice of good future teacher.

Keywords – Competition, Regional Center for Education and Training Profession (CRMEF), Scoring System, Evaluation, Teachers of Schools, Recruitment, Examination MCQ, Future Teacher, Teacher Trainers, Penalization, Determinant.

I. INTRODUCTION

Studies show that pupils receiving high-performance teachers will progress on average three times faster than those entrusted to inferior teachers [1]–[2]. Teachers must therefore be provided with the professional skills Quality education and this requires professional development, in other words, through initial and in-service training for teachers.

CRMEFs are primarily responsible for this performance

by choosing future teachers and then qualifying them during the initial training they make available to them.

Similarly to other countries, the Minister of National Education in Morocco organizes, at the beginning of each school year, a competition for the recruitment of candidates holding a bachelor's degree, master's degree, professional degree in education science, or other diplomas equivalent to the regional centers of the CRMEF [3]–[4]–[5]. This is part of the training framework for teachers in the secondary school qualifying and collegiate in physical chemistry. In this study, the method of evaluating the written test seems to us to be a crucial and decisive one in the choice of good future teachers, and allows us to plan the appropriate training program through the shortcomings observed during the evaluation of each module of the test. However, the comparative study between the predetermined scoring scale (given by the National Examination Center: experimental) and that given by theoretical scoring system [6] showed that an examination using a scale of penalties also do not discriminate against candidates and do not allow an adequate choice of good future teacher.

II. RESEARCH CONTEXT

Given the importance of the evaluation process in the field of recruitment, we scored the notes associated with each item of the written test (MCQ). A careful analysis of these notes suggests that two-thirds of the candidates who passed the written test found it very difficult to approach the examination as a whole and did not average. This observation allowed us to hypothesize: To what extent the scoring scale adopted by the examination center of the MENFP to weight this test influences the overall mark of the candidates and the tiebreaker candidates.

To verify our initial hypothesis, we carried out a comparative study between the weighting method of our written test (MCQ) and those existing in the literature, in order to identify the one that has subtlety to decide between the candidates. In other words, see for example the impact of the scale adopted by the National Examination Center (Fair answer = 1 or 2 or 3 points, Other answer = 0) and that

given by Roiron [6] of the candidates. The most appropriate weighting is that which is decisive in the choice of the right future teacher.

III. THEORETICAL FRAMEWORK OF THE MULTIPLE CHOICE QUESTIONNAIRE

A multiple-choice questionnaire (MCQ) is a survey or evaluation tool used in teaching as well as in quantitative

surveys in social research and marketing. In teaching, it is an evaluation process in which several answers are proposed for each question. One or more of these replies are correct. The others are wrong answers, also called "distractors". The MCQ allows a teacher to see that a candidate has understood and retained a correct answer and is able to identify errors. Different scales can be used to weight the results of a MCQ[6], Table I.

Table I : Different scales allowing the weighting the results of a MCQ

Weighting mode	Definition	Advantages	Disadvantages
Strict compliance	Right answer = 1 point Other answer = 0 point	Ease of use	Lack of subtlety to decide between candidates
Strict compliance with penalty	Right answer = 1 point Other answer = -1 point	The candidate who does not answer is still penalized	The note can easily be negative
Relative compliance	Result = Number of correct answers candidate / Nb total correct answers * point to the issue + Nb errors candidate / Nb total errors * point penalty	If the points per question are equal to the penalty points, the scale is balanced	It is impossible to have any true answer or false answer for this scale
Relative compliance with coefficient on response	Results = Σ correct answers coefficients of the candidate / Σ coefficients of total correct answers * point to the issue + Σ coefficients errors candidate / Σ of error coefficients of total* penalty points	Allows to give more or less importance to a proposal of answer: a serious error or a fundamental answer will have a strong coefficient and inversely	
Scale according concordance answers	Nb of pts if 0 error > nb of pts if 1 error > nb of pts if 2 errors > nb of pts if 3 errors > nb of pts (if nb of errors > nb of parametrized errors) (3 maximum)	The candidate who makes more mistakes is more penalized than the one who does less.	Errors are quantified, we are not concerned here with the content of the errors
Answer scale	Each response proposal is treated independently of the others in the same question: just checked = 1, unchecked = 0; Error checked = -1	The questionnaire is treated as a unit	All questions must have the same importance

Characteristics of a MCQ :

- Disadvantages of a MCQ:
 - The candidate can respond at random when he/she does not know and thus distort the analysis of the results. Some systems counter this by penalizing the error more than the lack of response (no choice);
 - The answer is not given by the candidate, but provided in the question;
 - The MCQ does not evaluate a candidate's ability to write or express themselves
- Advantages of a MCQ: when the questions are well designed, a MCQ can help:
 - Measuring an applicant's knowledge objectively;
 - Isolate a criterion of knowledge avoiding the hazards of a written answer;
 - Assess a wide variety of skills: knowledge, understanding, analysis, synthesis, evaluation;
 - Detect difficulties and serve as a basis for work through the statistics of results to return to what has not been understood in progress;
 - Automate the correction and thus evaluate large

- quantities of candidates in a very short time [7];
- Identify levels of difficulty using distractors;
- Be enriched in each test by analyzing the answers.

IV. RESEARCH METHODOLOGY:

The sample used: The number of candidates registered for the CRMEF entry competition is 1286. The candidates selected to take the written test are ninety.

Copies of the written test of physics - chemistry session 2015 - 2016 are corrected by a jury composed of teacher - trainers of the department of physics - chemistry, with a previously determined (predetermined) scale by the examination center of the MENFP.

The study sample consists of 30 corrected randomly selected copies of the 90 corrected copies of the selected candidates who passed the written test.

The analysis of these copies (Table 2, 3) allowed us, by means of coefficient relative to each item, to find the overall score of each candidate according to the two scales of experimental and theoretical notation, to calculate the frequency of the answers fair and the proportion of fair

answers (PQR).

The number of candidates who joined the CRMEF (who passed the written and oral exam) is thirty.

Table 2: Level of candidates by physical theme

THEME	Item	Coeff /Item	ERJ	ERF	ERN	FRJ (%)	P	PQR (%)
MECHANIC	Q1	2	18	9	3	60	0.6	20
	Q2	2	11	16	3	37	0.37	
	Q3	3	3	24	3	10	0.1	
	Q4	2	1	28	1	3	0.03	
	Q5	1	7	23	0	23	0.23	
	Q6	2	6	24	0	20	0.2	
	Q7	2	7	21	2	23	0.23	
	Q8	2	16	11	3	53	0.53	
	Q9	2	12	15	3	40	0.4	
	Q10	2	12	14	4	40	0.4	
ELECTRONIC	Q11	2	20	10	0	67	0.67	50
	Q12	3	11	16	3	37	0.37	
MAGNETISM	Q13	2	13	15	1	43	0.43	20
	Q14	2	16	13	1	53	0.53	
	Q15	2	13	16	1	43	0.43	
	Q16	2	9	18	3	30	0.3	
	Q17	2	4	22	4	13	0.13	
ELECTROSTATIC	Q18	2	17	12	1	57	0.57	10
	Q19	2	9	19	2	30	0.3	
	Q20	2	10	19	1	33	0.33	
	Q21	2	2	25	3	7	0.07	
	Q22	2	5	19	6	17	0.17	
OPTIC	Q23	2	15	15	0	50	0.5	17
	Q24	2	9	14	7	30	0.3	
	Q25	1	10	10	10	33	0.33	
	Q26	2	11	11	8	37	0.37	
	Q27	2	3	26	1	10	0.1	
	Q28	2	9	17	4	30	0.3	
WAVES	Q29	2	7	22	1	23	0.23	0
	Q30	1	7	21	2	23	0.23	
	Q31	1	13	16	1	43	0.43	

PQR Proportion of successful questions

ERJ Effective right answers

ERF Effect of false answers

ERN Number of unanswered questions

Table 3: Level of candidates by chemistry theme

THEMES	Item	Coeff /Item	ERJ	ERF	ERN	FRJ (%)	p	PQR (%)
STRUCTURE OF MATTER	Q32	2	27	2	1	90	0.9	83,33
	Q33	1	19	10	1	63	0.63	
	Q34	1	7	21	2	23	0.23	
	Q35	1	25	4	1	83	0.83	
	Q36	2	26	2	2	87	0.87	
	Q37	1	18	11	1	60	0.6	
	CHEMICAL THERMO DYNAMICS	Q38	2	9	21	0	30	
Q39		2	16	11	3	53	0.53	
Q40		2	9	20	1	30	0.3	
Q41		2	13	15	2	43	0.43	
Q42		2	13	16	1	43	0.43	
REACTIONS IN AQUEOUS SOLUTION	Q43	1	23	6	1	77	0.77	50
	Q44	3	9	15	6	30	0.3	
	Q45	3	4	22	4	13	0.13	
	Q46	2	15	14	1	50	0.5	
	Q47	2	14	10	6	47	0.47	
	Q48	1	15	12	3	50	0.5	
CHEMICAL KINETICS	Q49	1	8	20	2	27	0.27	0
	Q50	1	1	27	2	3	0.3	
	Q51	1	10	17	3	33	0.33	
	Q52	2	2	21	7	7	0.07	
	Q53	1	7	18	5	23	0.23	
	Q54	1	14	14	2	47	0.47	
ORGANIC CHEMISTRY	Q55	1	16	11	3	53	0.53	50
	Q56	1	20	8	2	67	0.67	
	Q57	1	9	19	2	30	0.3	
	Q58	1	14	14	2	47	0.47	

FRJ Frequency of correct answers

P Index of difficulty

Coeff/Item Coefficient per Item

Table 4: Overall score obtained per candidate according to the two scales of experimental and theoretical scoring.

Candidat Ci	C ₁	C ₂	C ₃	C ₄	C ₅	C ₆	C ₇	C ₈	C ₉	C ₁₀	C ₁₁	C ₁₂	C ₁₃	C ₁₄	C ₁₅
Note _{exp} /100	34	32	43	36	24	31	33	33	16	24	29	33	25	34	49
Note _{Theo} /100	-30	-6	-14	-16	-52	15	-34	-24	-25	-39	-38	-24	-49	-14	7

C ₁₆	C ₁₇	C ₁₈	C ₁₉	C ₂₀	C ₂₁	C ₂₂	C ₂₃	C ₂₄	C ₂₅	C ₂₆	C ₂₇	C ₂₈	C ₂₉	C ₃₀
34	30	34	55	53	71	37	41	35	31	37	34	30	66	50
-32	-36	-4	18	6	42	-26	-18	-29	-37	-25	-10	-20	33	4

V. RESULTS AND DISCUSSION

In this section, using the coefficient associated with each item of the written test, we found the overall score obtained by each candidate (Table 4) through the ministry's proposed rating scale (experimental scale) for this competition and that given by Roiron[6](theoretical scale) in order to check whether the choice of the rating scale for such a test is decisive in the choice of a good teacher, that is to say identify the one that has subtlety to decide between the candidates.

The result obtained (Table 4) revealed that the thirty (30) copies of our sample, chosen at random from the ninety (90) copies of the candidates who passed the written test, present almost all of negative scores according to the theoretical rating scale with the exception of 6 copies which have positive scores and do not reach the average. According to the experimental scale there are only five candidates who have an above-average score and the highest score is 71/100. The test scores vary from 16/100 to 71/100 with a standard deviation of 17.1 (less than half-mean 25) and therefore less spaced and those obtained according to the theoretical scale [6]ranged from -49/100 to 42/100 with a standard deviation of 28.2 greater than 25 the half-average (25) and therefore greatly dispersed by a averaging the mean (notes are widely spaced). Candidate C₂₁ which has a score above the average of 21 points (71/100) according to the scale of the competition (experimental scale), has a score less than the average of 8 points according to the theoretical scale (42/100). The candidate C₂₁, ranked first according to the experimental scale, passed the written test with a good score (71/100) has a score below the average (42/100) according to the theoretical scale of notation so not allowed. The one who has just the average (50/100) according to the experimental rating scale has only one note (4/100) according to the theoretical rating scale.

These findings suggest a relatively moderate test success rate according to the experimental and mediocre scale (null) according to the theoretical scoring scale: the experimental scoring scale is more decisive in the choice of good future teacher than the scoring scale theoretical.

VI. CONCLUSION

The results obtained during this comparative study between rating scales enabled us to conclude that:

- The point of vigilance in the QCM evaluation concerns the place of chance that would allow the candidate to select the correct answer without knowing it.

- The large difference in marks found using the two marking scales is due to the fact that the experimental scoring scale adopted for the CRMEF entry competition (simple scale: correct answer = 1 to 3 point, omission or false answer = 0 point, several responses = 0 point) does not adopt negative points to discourage random responses: prompts candidates to choose random responses and that the theoretical rating scale opts for more severe negative points (eg +1 for a good answer, -1 for an incorrect answer) that avoid the temptation to choose randomly when one does not know the answer.
- Examinations that use a more severe penalty scale do not discriminate between candidates.
- In order to avoid excessively increasing the difficulty of an examination and to be decisive in choosing a good future teacher, we propose to assign less severe negative points (+1 for a good answer, -0.25 for an incorrect answer).

Similarly, through this study, we were able to show to what extent the scoring system chosen to weight a test influences the overall score and the tiebreaker of the candidates. In other words, this choice of scoring system plays an inescapable role in the choice of good future teacher.

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