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The impact of the type of questions asked in continuous assessment on students' outcomes

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Abstract

This study's objective is to find the impact of the type of questions asked in assessments on students' results and to measure their capacity of synthesis. Also, we had analysed students' answer related to exercise that is a part of the subject of the first control about thermochemistry concerning the first university level science of chemistry subject in 2014. The recorded results show that when useful figures are designed in enunciations, students have ability to move easily to the next stages and could find out easily adequate answers, but when the question is without indication, students are lost in the choice of the figures that are part of the exercise. This problem is concerning the majority of students in different levels. These results push us to prepare lecture for subjects of the national exam Bac: mathematics, chemistry and physics as well as tests and interviews to have an access to high schools in Morocco.

Keywords: Assessment, students' level, thermochemistry, capacity of synthesis.

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1. Introduction

The assessment is a fundamental step in the educational process which concerns all partners, 'Students who focus their learning on success in the examination; teachers to whom the evaluation sends back a reflection on the effectiveness of their teaching; the institution for which the assessment is a test of the finished product; the company guarantee that protects the duly certified skills' (J.-F. d'Ivernois). However, students' grades do not reflect their true level; we are faced with students who have a higher level of study and who do not have the ability to answer some questions related to basic concepts that have already been studied (Tamani, El Jamali, Dihaj & Radid, 2015).

2. Methodology

This study aims to look for the impact of the type of questions asked in continuous assessments on student outcomes and measure their capacity of synthesising, thus, we have taken as a sample of our study, the students of the first academic year science stream chemistry matter.

Thus, we analysed the responses of students on an exercise that is part of the subject of the first thermochemistry test of the first academic year of the (science stream chemistry matter) students in 2014. The examined copies are 956, and they are part of 19 different packets corrected by four teachers. This exercise consists of two types of questions: it is about giving the molar enthalpy of the formation of two chemical compounds: CH4 (g) and H2O (l).

In the first question, the student is guided to determine the molar enthalpy of the formation of CH4 (g) (the equations balance sheets to use are identified) while for the second question, the student is required to calculate the energy of the formation mole of another chemical compound: H2O (l) without any indication of the next steps.

The proposed exercise was formulated as follows:

(1)	CH_4 (g)	+	$2O_2$ (g)	→	CO_2 (g)	+	$2H_2O$ (l)	$\Delta H°_{298} = -890$ kJ
(2)	C (gr)	+	O_2 (g)	→	CO_2 (g)			$\Delta H°_{298} = -394$ kJ
(3)	$2H_2$ (g)	+	O_2 (g)	→	$2H_2O$ (l)			$\Delta H°_{298} = -572$ kJ
(4)	SO_3 (g)	+	H_2O (g)	→	H_2SO_4 (g)			$\Delta H°_{298} = -239$ kJ
(5)	H_2SO_4 (l)			→	H_2SO_4 (g)			$\Delta H°_{298} = +722$ kJ
(6)	SO_3 (g)	+	H_2O (l)	→	H_2SO_4 (l)			$\Delta H°_{298} = -125$ kJ

i Applying the algebraic method to reactions (1), (2), and (3), calculate the molar enthalpy of the formation of CH4 (g)?

ii Calculate the enthalpy of vaporisation of H2O (l)?

The expected responses are:

i

(1) CH_4 (g)	+	$2O_2$ (g)	→	CO_2 (g)	+	$2H_2O$ (l)	x (–1)
(2) C (gr)	+	O_2 (g)	→	CO_2 (g)			x (1)
(3) $2H_2$ (g)	+	O_2 (g)	→	$2H_2O$ (l)			x (1)

.....

(R) C (gr) + $2H_2$ (g) → CH_4 (g)

So $R = -(1) + (2) + (3)$

The molar enthalpy of the formation CH4 (g) is then expressed by:

$$\Delta H_{f,\,298\,(CH4\,(g))} = \Delta H_{298}(R) = -\Delta H_{298}(1) + \Delta H_{298}(2) + \Delta H_{298}(3)$$
$$= 890 - 394 - 572$$
$$= -76\text{kJ}$$

ii

$$(4)\ SO_3\ (g) + H_2O\ (g) \rightarrow H_2SO_4\ (g) \quad x(-1)$$
$$(5)\ H_2SO_4\ (l) \rightarrow H_2SO_4\ (g) \quad x(+1)$$
$$(6)\ SO_3\ (g) + H_2O\ (l) \rightarrow H_2SO_4\ (l) \quad x(+1)$$

.....

$$(R)\ H_2O\ (l) \rightarrow H_2O\ (g)$$

So: $(R) = -(4) + (5) + (6)$

The enthalpy of vaporisation is then expressed by:

$$\Delta H_{298}\ (R) = -\Delta H_{298}(4) + \Delta H_{298}(5) + \Delta H_{298}(6)$$
$$= 239 + 722 - 125$$
$$= 836 kJ$$

3. Presentation of the results

We present the results of question 1 in the Table 1 and Figure 1 and the results of question 2 in the Table 2 and Figure 2 while Figure 3 shows the comparative results of both questions 1 and 2:

Table 1. Students' responses to question 1 (thermochemistry test of the school years: 2013–2014)

Marks	[0, 5]	[5, 10]	[0, 10]	[10, 15]	[15, 20]	[10, 20]	[0, 20]
Correct answer	23	189	212	274	143	417	629
False answer	227	83	310	16	1	17	327

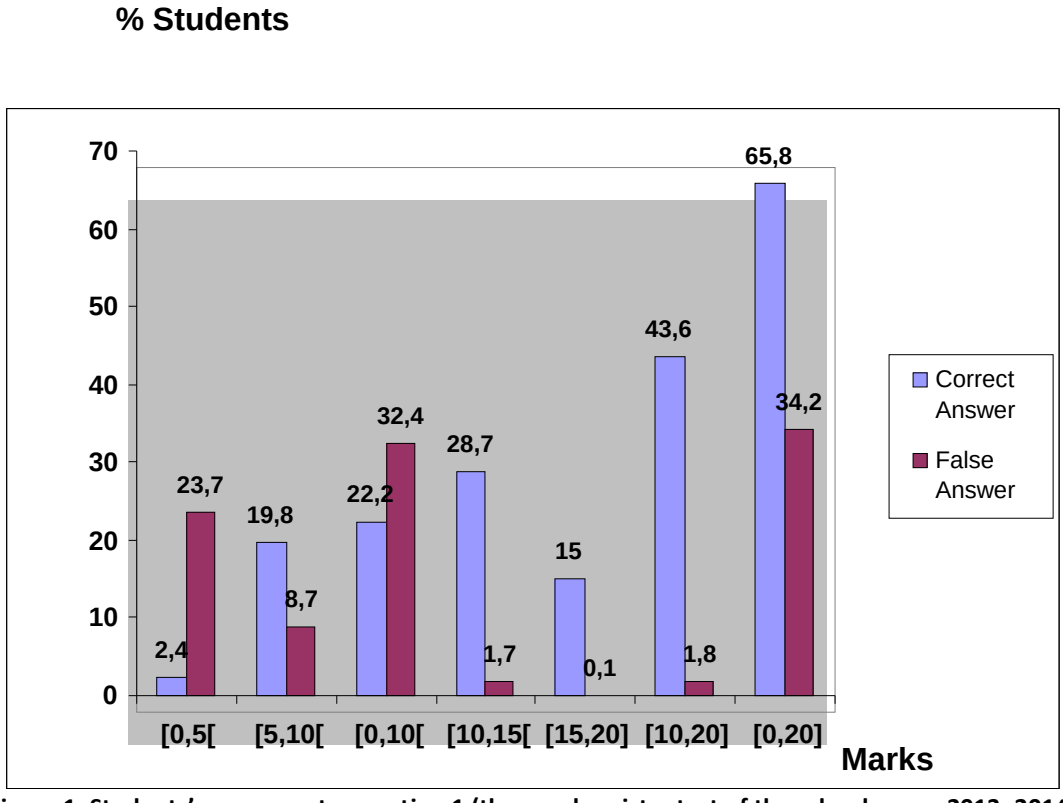

Figure 1. Students' responses to question 1 (thermochemistry test of the school years: 2013–2014)

Table 2. Students' responses to question 2 (thermochemistry test of the school years: 2013–2014)

Marks	[0, 5]	[5, 10]	[0, 10]	[10, 15]	[15, 20]	[10, 20]	[0, 20]
Correct answer	0	2	2	32	87	119	121
False answer	250	270	520	258	57	315	835

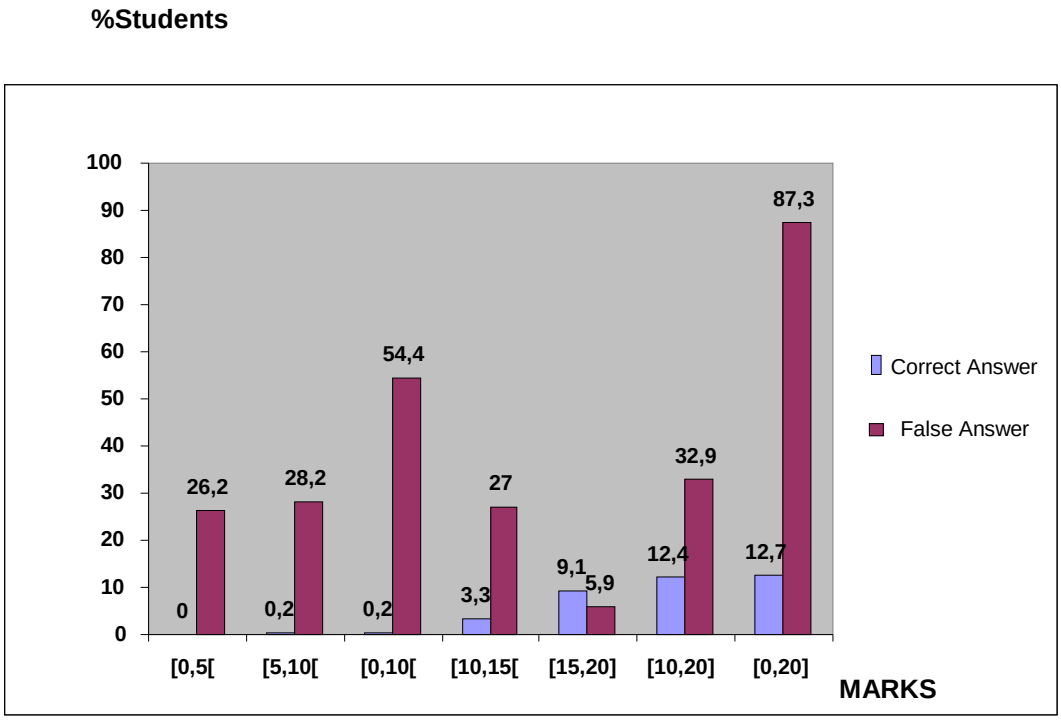

Figure 2. Students' responses to question 2 (thermochemistry test of the school years: 2013–2014)

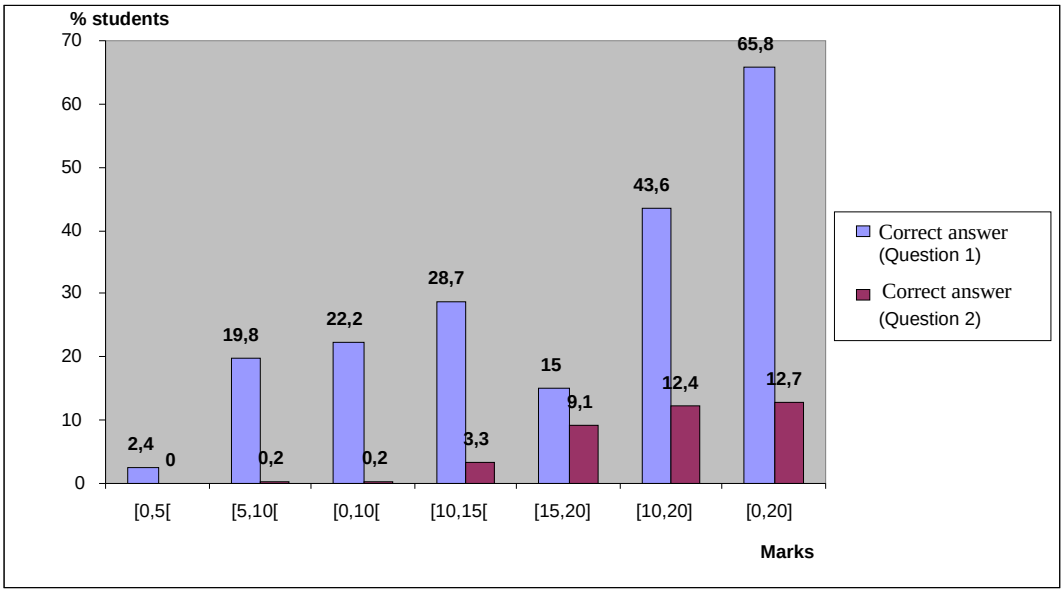

Figure 3. Correct answers of students to questions 1 and 2 (thermochemistry test of the school years: 2013–2014)

4. Analysis and synthesis of the results

Most of the students were able to answer question 1 (65.8%); we note that almost all the students with the average of 10/20 and almost half of the students who have not had this average was able to answer this question correctly.

However, question 2 which requires a little thought about choosing balance equations has shown poor results; almost all students (87.3%) could not answer this question properly and even those who have had a higher mark or equal to 15/20 (57 among 144 students).

So when the balance equations have been identified in the question of calculating the enthalpy of the formation of the chemical compound in question, students were able to address the next steps and could easily find the right answers while when the question is without any indication, students get lost in the selection of reactions to use from data of the exercise, indeed this problem concerns most students regardless of their levels.

By doing a brief reading on the questions asked in the national Baccalaureate exam of mathematics and physics–chemistry as well as the national entrance examinations to major higher schools in Morocco (limited access), we find that each question is dissected into several issues, and the students are used to having more details on the question to answer it correctly, however, this problem persists in the university and teachers adapt the tests and the examinations according to students' level.

5. Conclusion

When the student is oriented in the question, (s)he can answer it easily, but if not, (s)he is lost in the choice of the data to use. Yet this problem concerns the majority of students regardless of their levels, at thing which they bring with them from the very secondary level, thus, the assessment practices during chemical thermodynamics do not seem to make students gain some skills which are, however, at the heart of the objectives of education, such as the ability to analyse and synthesise especially that the learner orients his training on what will be assessed and according to what and how to do it (Biggs, 1999; Charlin, Bordage & et Van der Vleuten, 2003; Guilbert, 1990; Jouquan, 2002; Romainville, 2000). Thus, student grades do not reflect their actual levels.

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