

Difficulties of Apprehensiveness Concerning the Concepts of Chemical Thermodynamics Basis Related to the Evaluation of the Practices: Case about Students First Chemical Year at Ben M'Sik Faculty of Science



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Abstract: *The main goal of teaching of science in general and chemistry in particular, is to help learners to understand and to interpret phenomena of the natural world by adopting a scientific approach.*

The level of students in scientific disciplines and particularly in chemistry is becoming lower; something known by almost of actors in the field of higher education. The difficulties are many and the causes are diverse.

Despite the reform experienced by the Moroccan university, the results of our teaching are still not up to the needs of the labor market (phenomenon of unemployed graduates and at the same time shortage qualified human resources in the labor market).

We are wondering, if students are able towards the end of a stage of formation, to use the fundamental concepts supposed to be acquired, to explain certain phenomena and to predict others.

In this research, our objectives is to put up an evidence concerning the difficulties of apprehensiveness of concepts about chemical thermodynamics for students following their studies at the first year university option Science of Chemistry (SMC) subject dealing with the relationship between the difficulties and practices of evaluation during the course.

We were searching for the problems of apprehensiveness due to student's characteristics and the system of teaching of this course. In fact, we have realised a relation with teachers teaching at the first year (SMC) and we have distributed a questionnaire for their students. After that we had examined evaluation of practices in this course following the same stages that had been followed before in order to look for the relationship between practices and difficulties.

Keywords: *concepts of chemical thermodynamics, evaluation of apprehensiveness.*

I. INTRODUCTION

Many studies had discussed difficulties of mastering concepts of chemical thermodynamics by students at the university [1, 2, 4, 5, 6, 8, 10, 11, 13, 15, 16, 17, 18, 19, 20, 22] We found out that there is a lack of studies that can study these difficulties in a Moroccan context.

In fact, in a such situation concerning a study about the presence of these difficulties and its sources for Moroccan students especially those who following their studies at Ben M'Sik option (*Science of Chemistry : SMC*). We were dealing with explorative study [21] during a test of evaluation and analysis of students'copies which reflected a lack of assimilation of certain concepts extremely related to thermochemistry basis studied at Semester 2 and this problem had been remarked for certain different levels of studies (Semester 2, Semester 4, Semester 6, master and doctorate) in this case students found out that they were facing different levels which created difficulties of apprehensiveness of new knowledges.

Other practices of research [9, 12, 7, 2003, 3, 14] had revealed the role of evaluation as a process that helps the evolution of apprehensiveness and at the same time orient it meanwhile these practices of evaluation of apprehensiveness aren't considered as the main cause of this problem.

What are the sources of difficulties of conceptualisation concerning the chemical thermodynamics for students following their studies at science Ben M'sik faculty?

What are the relationships between difficulties and practices of evaluation of apprehensiveness (course about thermochemistry ?

What are the elements that can permit amelioration of such teaching-apprehensiveness about the chemical thermodynamics at the Moroccan University?

II. METHODOLOGY OF STUDY AND CHARACTERISTICS OF A MODEL OF INSPECTION

Ben M'sik University and Hassan II University in Mohammedia are ones of institutions that have an open access and can react by the same laws and rules as well as the other universities of science, in fact,

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we had considered as a population as a population of our study concluding all teachers teaching chemical thermodynamics at the first year option SMC (Science of Chemistry) and the students belonging to the same option. We had targeted approximately 20% of the official effector of students who followed the course of chemical thermodynamics under the guidance of the three teachers teaching this subject we had found out a personal relationship of the majority of these teachers.

The study, at the first phase, had targeted the difficulties of apprehensiveness of concepts related to the chemical thermodynamics linked to the student's characteristics and the system of teaching that's why we decided to deal with an interview with teachers who had to answer our open and enclosed questions depending on four categories: characteristics of the chemical thermodynamics concepts and relying on the course; studying of difficulties of apprehensiveness of the chemical thermodynamics concepts for first year students option SMC;

The causes of these difficulties and solutions proposed. A second questionnaire had been delivered to students relying on four categories such as. The personal students' report, difficulties of apprehensiveness of these concepts to students without neglecting the conditions of teaching the course about thermodynamic concepts, furthermore, comprehension and amelioration of the proposed concepts.

At the second phase, we had been searching the difficulties of apprehensiveness of concepts related to the chemical thermodynamics and practices of evaluation of apprehensiveness that led us to have an interview with teachers; the items of this interview was based on five categories: practices of evaluation, types of tasks of evaluation, professor's communication with student; formation of teachers and implication of professorial corps concerning amelioration of evaluation of apprehensiveness, another questionnaire had been adapted especially for students, the items of this questionnaire can be divided in two categories: student and teachers' communication practices of evaluation.

III. RESULTS AND DISCUSSION

Thanks to the analysis of teachers and students' answer we had achieved the following results.

The difficulties of apprehensiveness of the concepts concerning the chemical thermodynamics are evidently related to three essential factors and consubstantials that interfere among them and are the student's characteristics, the system of teaching and quality of evaluation.

Concerning the difficulties related to characteristics of student, cites:

- The modest students' levels following their studies at universities with an open accessibility
- The weak capacity of the used language.
- The problem of exploitation of mathematical knowledges in chemistry.
- The frequent student's absence concerning the course and TD that can humble the continuity of the comprehension of the course and TD and that can't motivate the student.
- Lack of initiation concerning the entire dependence on what was given during the TD course.

Concerning the difficulties related to the teaching can evoke:

- The failure at the level of definition concerning the objectives of the course based on chemical thermodynamics and the students' ignorance; as a consequence, the apprentice is asked to reduce apprehensiveness to memory of the contents and the apprentice should be able to master these contents before the beginning of the course.
- Abstract aspect of the course due to a lack of clarification of its practical interest leading to the absence of the student's motivation.
- The rapidity of teaching.
- The lack of chemical thermodynamics TP.
- The student is overcharged by the semestrial programme.
- The time dedicated to TD is insufficient.
- The lack of better conditions of teaching (rooms, equipments, hours...)
- The method of teaching is not motivational and a buse the quantity of apprehensiveness.
- A lack of pedagogical formation teachers.

Concerning the difficulties related to practices of evaluation of apprehensiveness about chemical thermodynamics we can mention:

- The objectives of the chemical thermodynamics course aren't well defined and especially not well formulated in describing the option, that's why the objectives that teachers evaluate and the validity of evaluation can be the spot of a lot of questions.
- Elements used for the evaluation concerning the apprehensiveness of the chemical thermodynamics course isn't diverse, we observe the predominance of exercises.
- Teachers don't share the same vision during realisation of controls.
- The coverage of the course is not workeable in the absence of references that could define the ponderosity of each part of the given course.
- Evaluation of subjects of the given exams and tests are weak and not challenging due to the absence of an accurate basis in term of comparing.
- The exam's questions are not clearly formulated
- The notability of exams are often subjective according to the students.
- The discrimination between students and teachers' responses which is extremely normal because of the lack of concrete references.
- Each term students are given one contrôle which is insufficient and which not confirmed with the official instructions.
- The criteria of scoring controls and exams is certainly evaluated, archives of certain exams concerning the chemical

thermodynamics corrected by teachers ; moreover, we insist on the formation of certain teachers to be at a good level pedagogically and have a great ability to create technics of evaluation, but we have a deception when it is question about students and teachers' effectiveness during the course and TD or during the exam and tests that leads to insufficient infrastructures and non formation of certain teachers ; consequently, it can have a negative impact on learners and the application of evaluation of the formation.

Teachers score the students' mistakes at TD perfectly during the course which is very normal because of the outnumbered students, but he's remains insufficient after the usage of controls and exams. In addition to that teachers don't give much importance to errors found on the copies. Their interventions are insufficient ; weak during the course ; very weak after each contrôle and a little bit lacking after each contrôle.

The second session doesn't give much importance ; moreover, interventions still remain inefficacious in the presence of a modest analysis of errors ; consequently, students don't receive information which leads to a loss of the value of continuous controls and set up a system of a formative evaluation. Multitude of students are conscious about the necessity of the continuous controls and the majority of them assure that the controls don't permit to the learner to ameliorate his courses teachers don't give much importance to the analysis, synthesis, and interpretation of students' marks, the evaluation of the subjects of the tests and exams. This task is the responsibility of those who put up modules and it is also a duty of a departmental sector. It is remarked that evaluation is principally a responsibility of administrators more than pedagogues.

The taken decisions after the interpretation of the results don't take into consideration the following points :

Modification of the approach concerning the course, a change of the adopted strategy, the usage of the explication and organisation of seances that require to sustain pedagogy for students in difficulties and evaluation is confined to one stage that is the condition of the notes.

Evaluation related to the course about the chemical thermodynamics by teachers is greatly weak as well as their interventions when they found out a lack of certain notions. Then we ask questions about these notions teachers evaluate.

Evaluation of the notions related to the course of the chemical thermodynamics by teachers are very weak ; moreover, the practices of evaluation of the course don't seem to provide students with certain competencies that reflect the real and concrete teaching at our universities as the autonomy, the initiative mind, responsibility and critical mind.

We notify a great diversion between teachers and students' responses concerning the communication of the objectives of the course, criteria of evaluation, the mode of calculation of the level, the planning of the controls and the archive of continuous controls of chemical thermodynamics with the correction provided by teachers ; moreover, students don't participate in the process of evaluation.

IV. CONCLUSION

Axes of amelioration would be possible and permit to resolve progressively this problem about teaching-apprehensiveness more efficace and more productive for the concepts of the chemical thermodynamics.

Meanwhilem, each action or measure should include the following norms of development.

- Guide, sustain students belonging to the first year (university) having difficulties during the transition especially different levels without professional project. We inspire from the french example, how we could sustain students in difficulties :
 - o Math-Bridge : individual strategy.
 - o Cap licence : available help for a such transition (lycee-university).

The two projects have the same objectives of the course and formulate SMPC (Science of physics and Chemistry) and transmit them to teachers and students and orient evaluation of apprehensiveness according to these objectives.

- Define the proper norms for each chapter of the course, to formulate them and communicate them to all teachers and students, evaluate them before the beginning of the course, intervene if it is necessary.
- Present perfectly the content of the course and TD integrate, what is historic, objectives and applications of the course, clarifying the relationship with the other subjects, select better exercises treated at TD using a style of reading in a simple way, adapt it at each discipline towards an experimental stage.
- Revising the method of teaching of mathematics at the second cycle by integrating exercises at the end of each exercise and exploit knowledge acquired during maths courses without neglecting those of chemistry and physics.
- Avoid the bad practices at the lycee :
 - o Give and try to resume the courses without demonstration
 - o The ultimate bac exams about physics/Chemistry containing the same types of exercises.
- Adopt a didactic method active (integration of TICE ; TP, Videos, films of industry... , activities, searching reports) oriented towards a deep teaching that assure the student about the choice of discipline and permit him to exercise the sense of creativity, and autonomy in his own abilities.
- Elaborate referential contrôles and exams for this subject as well as for the others, respect it and communicate it to all teachers and students.

This reference must contain according to each semester :

- Objectives of apprehensiveness and competencies to evaluate.
- The planning of contrôles and exams.
- The number of contrôles
- The ponderosity of each part of course for all exams and tests.
- Percentage of each capacity to evaluate.
- The mode of calculating the level.

This reference takes into consideration the following points :

- The coverage
 - The representation
 - The conformity : (scientific precision, progression in difficulties, articulation between the questions and all parts of the exercise, objectives of each exercise...)
- Develop an evaluation grid of control subjects and exams.
 - Revise the proposition of elimination of continuous controls for S1 and S2 improving its importance during their application.
 - Diversify elements of evaluation :
 - Integrate QCM, Phrases to complete, false/true, QROC to avoid the difficulty of the language (French) for the student and facilitate at the same time the correction of tests.
 - Integrate situated problems and studies of the case.
 - Program TP and evaluate them practically
 - Organise excursions concerning industry, courses in place and asking questions about real facts.
 - Change the system of tests, substitute classical tests by others more objective evaluating not only memory and comprehension, but also capacity of analysis, synthesis, resolution of real problems and a taken decision (bloom's taxonomy) as well.

It will be useful to introduce a quota of adequate questions on the sense of concepts and phenomenon. This is extremely linked to propositions of the same nature done for the laws of gas (Samrey 1990) (modification of didactic contract).

The same for TD, we propose to choose exercises that take into consideration these capacities and must be constructed during the process of apprehensiveness (the course, TD and TP) and finally should be evaluated trough contrôles and exams (final exam) these capacities should be defined and formulated without neglecting references of controls and exams.

- Giving more importance to analysis, synthesis and interpretation of students's notes and never attribute this task only to a reponsible of the

modulus in order to permit a teacher intervene appropriately following the results of these aspects.

This can be done only in the presence of the staff teaching of TD and TP well trained on concepts of docimologie, possessing necessary means in a precising conditions (sufficient hourly volume, convenient and stable effectivness of students, necessary equipments, and adequate locations) to achieve these objectives, assuring an appropriate insertion of these students who should be easily integrated in society carrying on their own contributions to economic, social, and cultural development of their home contries.

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