Open Access Library Journal
2017, Volume 4, e3985
ISSN Online: 2333-9721
ISSN Print: 2333-9705

Implementation of the Goal-Oriented Pedagogy in the Teaching of Chemistry in the 5th Grade of the Malagasy Education System

Zo Andraina Ratsimbatoha

Lycée Français de Tamatave, Toamasina, Madagascar
Email: zo-andraina@live.fr

How to cite this paper: Ratsimbatoha, Z.A. (2017) Implementation of the Goal-Oriented Pedagogy in the Teaching of Chemistry in the 5th Grade of the Malagasy Education System. *Open Access Library Journal*, **4**: e3985.
https://doi.org/10.4236/oalib.1103985

Received: September 28, 2017
Accepted: October 23, 2017
Published: October 26, 2017

Abstract

According to the directives of the authorities, the teaching of chemistry in the 5th grade follows logic by objectives in the Malagasy educational system. Consisting of lectures, application exercises and evaluations similar to these exercises, the use of this approach in two classrooms at the Lycée Toamasina II highlighted that the level of proficiency of the pupils decreases as the taxonomic level of the objectives increases. On the one hand, goal-oriented pedagogy aims at the assimilation of notions by the conditioning of students, requiring considerable academic time and not allowing accompaniment and remediation. On the other hand, it does not take into account the learning process of students, limited to a binary evaluation of the attainment of objectives. Moreover, the use of acquired knowledge is limited to specific school contexts, making it difficult to reinvest them.

Subject Areas

Education

Keywords

Goal-Oriented Pedagogy, Pedagogic Objectives, Learning Process, Achievement Process

1. Introduction

According to a notice from the Ministry of National Education [1], the pedagogical method applicable to Madagascar since the beginning of 2015-2016 is the goal-oriented pedagogy. It involves installing a method that helps students learn lessons, and thus pass exams. In order to improve the quality of education in

Madagascar, the Ministry of Education aims to encourage the participation of students during the learning process during class by using investigation process, by questioning students about the lesson, and by encouraging them to correct the exercises on the chalkboard. The aim is not to complete the curriculum by subject, but to facilitate teaching, while at the same time encouraging students to participate more creatively. It always consists in setting a goal before anything else. With the goal-oriented pedagogy, the teacher should always show to the students the objective to achieve their studies.

This approach, introduced in the Malagasy education system in the 1990s [2], involves more the teacher than the student. During class, the student is only an observer; the teacher gives him all he needs to know through an explicit school program [3]. So, the development of the concept of objectives and its operational applications was closely associated with the idea of systematic planning of training activities, using a systematic approach including needs analysis, determination of learning objectives, choice of teaching methods, and the establishment of a system of assessment of learning in order to verify the achievement of objectives. In this approach, the teacher has three objectives, namely the knowledge, the know-how and the expertise of the apprentice. During the school year, the program is distributed in time; during such a month the pupil must learn such a lesson; in the notation, only the exact answer to a question will have a note and a part of the exact answer is not considered.

According to the ministerial directive [1], we used goal-oriented pedagogy in chemistry teaching in two 5th grade's classes at the Lycée Toamasina II in order to determine the impact of this pedagogical approach on the proficiency level of students. The implementation of this teaching method consists in dividing the knowledge to be transmitted into as many objectives to reach, and allows checking if a specific objective is reached by the students; to do this, we decided to give the lesson in a masterful way, the exercises were done at home and corrected in class, and the assessments are similar to those exercises; we tried to determine whether students reached the specific objectives corresponding to the assessed concepts [4] [5] [6] [7] [8]. The objective of our study is to demonstrate that, in opposite to what is intended, the implementation of goal-oriented pedagogy in the teaching of chemistry does not lead the student to success, both in the acquisition of knowledge, intention of the designers of this method, and in the completion of the schooling, reflecting the will of the ministerial officials.

2. Research Methodology

The study we conducted was carried out during the two first quarters of the school year 2016-2017 with 49 students of the 5th grade 6 and 49 students of the 5th grade 9 of the Lycée Toamasina II. We used as a framework the physical science curriculum of the 5th grade defined by the Ministry of National Education and we aimed at the specific objectives of the part on the matter and its chemical transformations [9]. During the classroom sessions, we observed the

behavior of the students induced by the implementation of our teaching. The evaluations enabled us to take evaluate the achievement of the specific objectives [4].

2.1. Implementation of the Teaching

During the teaching of the content of the program, we opted for the traditional method which consists in giving the lesson to be copied by the students with the corresponding explanations and answering their questions [5]. At the end of each lesson, the teacher gives the application exercises to do at home, and correct in class for the next session; the exercises are given with increasing difficulty as defined by the Bloom taxonomy [10], and associated with specific objectives in the program [6]. At the end of the correction of a series of exercises, the teacher foresees a classical assessment based on the objectives and similar to the exercises of application.

The assessment is done individually, and carried out over a time defined by the teacher. The evaluation topics were developed to include the concepts which were taught in order to determine whether each of the specific objectives had been achieved; the questions were written with respect to the different taxonomic levels. For each specific objective, a number of exact expected responses have been defined to validate the achievement of this objective; at the end of the correction of the copies, a specific objective is validated or not validated, according to these responses [4]. During the progression, two assessments were carried out: one after completing part of the program and the other at the end of the program. The objectives already evaluated in the first evaluation were taken up in the second assessment, in addition to the specific objectives relating to the addressed concepts between the two assessments.

We would like to point out that as a result of many unforeseen events which occurred throughout the school year (pause during the Francophonie summit, the cyclone, school days, etc.), we were unable to complete the program. Knowing that institution in which we operate, as well as almost all the public schools in Madagascar, does not have adequate laboratory and materials for carrying out practical work, although some parts of the program must be addressed experimental way. However, this situation does not affect the relevance of our study because the achievement of the objectives was judged in relation to the contents which could be tackled.

2.2. Progression of the Teaching

Table 1 shows the progress of teaching session after session and the nature of the implemented activities, including the specific objectives and content of the program [9].

2.3. Association of Specific Objectives Assessed at a Taxonomic Level

Establishing a match between the specific objectives with the different taxo-

Table 1. Progress in teaching chemistry during the school year 2016-2017.

Specific objectives	Session	Contents	Activities
The student must be able to: – explain what the copper element is – describe the structure of the atom	1	➢ Matter and its chemical transformations 1) Chemical element 2) Structure of the atom	Lesson
– represent a chemical element by its symbol	2	3) Symbols of chemical elements	Lesson
	3	To appropriate of the notion of chemical element	Exercises
– write the electronic formula of atoms of the first 20 elements of the periodic table	4	To establish the electronic structure of chemical elements from their atomic numbers	Exercises
	5	Determine the atomic number of an element from its electronic structure	Exercises
– justify the change of line – give the characteristics of the elements of the alkali family, halogens and inert gases	6	4) Periodic classification of chemical elements	Lesson
– locate an element in the periodic table	7	Locate a chemical element in the periodic classification from its electronic structure	Exercises
	8	Written exam	Assessment
	9	Correction of the written exam	Correction
– state the byte rule	10	➢ Ions and ionic compounds 1) Rule of the duet and the byte 2) Monoatomic ions and polyatomic ions	Lesson
– explain the formation of a monoatomic ion – give examples of polyatomic ions	11	3) The ionic compounds 4) Formation of monoatomic ions	Lesson
	12	Formation of ionic compounds Formation of monoatomic ions	Exercises
	13	Quarterly assessment	Assessment

nomic levels facilitates the correction of the students' copy sheets and thus identifies the level reached by each student. In Table 2, we associated the specific objectives we assessed with their taxonomic level.

3. Results

Since goal-oriented pedagogy draws its foundations from behavioral psychology [10], observing students' behavior during each session is important for analyzing the learning process leading to goal achievement. The assessment of the attainment of objectives is done in a binary way: either the objective is reached, which means that the learning is successful, or it is not achieved.

3.1. Observation of Students in Progress

During the sessions, we note that the students do not participate. Indeed, as these students were always accustomed to the transmissive method, they are attentive to the teacher's explanations, recopy the lesson, and do the exercises

Table 2. Correspondence between taxonomic levels and specific objectives.

Taxonomic level	Specific objectives
Knowledge	The student must be able to: – describe the structure of the atom – represent a chemical element using its symbol – give examples of polyatomic ions
Application	The student must be able to write the electronic formula of atoms of the first 20 elements of the periodic table
Analysis	The student must be able to: – explain the formation of a monoatomic ion – locate an element in the periodic table

according to the given instructions. The master part of the course is therefore done quickly. During the course, the teacher asks the students to question him if notions have been clear; in fact, after each step of his explanation, the teacher asks the students if they did not understand. Generally, students do not ask any questions and claim that everything is clear. In addition, questions from students are rare. So, feed-back from students seems to show a positive response on their part, and therefore a success of their learning.

During the correction of the application exercises, we notice that most students did not do the exercises, and are waiting to copy the correction. Generally, only good students did the exercises and ask the teacher in case of difficulty; they volunteer for correction, and demonstrate the achievement of the objectives corresponding to the exercises through their answers. Therefore, we cannot judge the achievement of objectives through exercises and classroom sessions. Only during the scheduled assessments, we can meet if the objectives have been achieved.

3.2. Assessment by Objectives

When correcting the copy sheets of the written question and the quarterly composition, we identified for each student the achieved objectives and those that were not met, based on the answers he gave. For all the students, we therefore calculated the percentage of students who achieved each objective and those who did not. These percentages are shown in **Table 3**.

Based on the results of our study shown by **Table 3**, the average of the students' achievement of all objectives was 45.33%. This average reflects an inefficiency of education that was provided. In addition, only two of the six assigned objectives in this part of the program have above average achievement rates, while for the other four objectives, less than half of the students achieved them. Analysis of students' sheets also reveals that students find it difficult to replicate answers identical to those given when exercises are corrected, while assessment subjects have the same form and assessment requires that the objective is achieved only if the student succeeds in replicating the expected response.

Table 3. Percentages of success and failure for each objective.

Specific objectives	Percentage of students who validated the impairment	Percentage of students who did not validate the impairment
The student must be able to describe the structure of the atom	61.15%	38.85%
The student must be able to represent a chemical element using its symbol	43.80%	56.20%
The student must be able to write the electronic formula of some elements of the periodic table	36.66%	63.34%
The student must be able to locate an element in the periodic table	28.50%	71.50%
The student must be able to give examples of polyatomic ions	60.12%	39.88%
The student must be able to explain the formation of a monatomic ion	41.76%	58.24%
Average	45.33%	54.67%

When we compare the percentages of success with the progress of education, we can see that the achievement rate of objectives decreases as we progress in the content. For the lesson on matter and its chemical transformations, the success rate went from 61.15% for the first objective, to 28.5% for the fourth objective; the evaluation of the first specific objective, which corresponds to the beginning of the lesson, shows the highest success rate and the last specific objective assigned to this part of the program is that of which the most students have not reached. Then, we discussed the lesson on ions and ionic compounds; the assessment of the achievement of the objectives corresponding to the content of this lesson shows that the success rate for the first objective is higher than that for the second objective; that also means that for this part of the program the specific objective corresponding to the first part of the lesson is reached by more students than the specific objective corresponding to the end of the chapter. So, the finding shows that the more one progresses in the teaching of a lesson, the more the rate of achievement of the specific objective corresponding to the addressed content decreases.

As the assessment subjects were developed to include the different taxonomic levels, the previous table shows that the objective achievement rate decreases as the taxonomic level increases. For the first lesson assessment, respectively 61.15% and 43.80% of the students achieved the specific objectives relating to the level of restitution, 36.66% of the students reached the objective relating to the level of application, 28.50% reached the objective relating to the level of analysis; for the second lesson assessment, 60.12% of students reached the objective relating to the level of application, and 41.76% of students reached the objective relating to level of analysis.

4. Discussions

The traditional method habituates the students to listen to the teacher and to consider the given lessons like ideas not to be questioned. In this approach, students are never in a situation of research or construction of knowledge; they are conditioned by the lecture given by the teacher. Goal-oriented pedagogy consists of making students impose what they have to learn. They are then led, through exercises of application, to adopt behaviors relating to the asked questions; indeed, the expected answers in the assessments of the achievement of the objectives do not incite individual productions, but are defined and standardized beforehand. Since the assessment subjects are drawn up identically to the application exercises, an objective is considered to be achieved by the student by identifying the fact that he was able to reproduce the expected answers; the teacher does not take into account the learning process which led the student to achieve the objective.

The goal-oriented pedagogy is praiseworthy in its mastery, insofar as student receive the content corresponding to the intended objectives, and whose use is required during the evaluation; its implementation refers the exercises to "homework assignments", in order to allow the teacher to make a collective correction and an overall explanation for the return to class. Being always accustomed to this mode of learning, the students cannot do without the preponderant intervention of the teacher; the explanations provided by the teacher and the answers for their individual questions give them an assurance of a good progress in their learning and a sense of ability to succeed. This method allows students to focus their learning on essential concepts.

After course, students are expected to learn and assimilate the lesson content so that it can be used in the resolution of the exercises. The assimilation of the lesson and the solving of the exercises are carried out outside school time, because the time allocated over the school year does not allow the teacher to plan sessions during which the students get impregnated with the content of the lesson and take the time to do applications. However, when students learn their lesson and do the exercises outside of school time, they can often encounter difficulties and cannot have support to overcome them. Often, at the moment of the assimilation of the lesson and the resolution of the exercises, the student needs help, to be supported and accompanied, a role assigned to the teacher's profession.

The taxonomic leveling of the assessment and the assimilation of the answers by the students requires a considerable amount of time for the students to be able to give the expected answers. Indeed, this conditioning requires the resolution of many exercises by the variation of the treated situations, and the progressive elevation of the level of utterances. The assessment of the level reached by the students and the achievement of the objectives is left to the discretion of the teacher, in particular by observing the behavior of the students following the implementation of his teaching.

The teacher adopts his teaching strategy in order to achieve objectives. Since the assessment he implements is binary, he cannot follow the evolution of his students' learning; he cannot only judge the progress of each student during his apprenticeship. He only considers that the student must be conditioned, and thus adopt a behavior which can be used to identify the attainment of objectives. At the time of the assessment, the teacher judges whether the student achieved the objectives, he does not question the causes of the success or the reasons for the failure, and does not have the means to challenge his teaching. The important thing for the teacher is to achieve the objectives of the program.

The teacher may choose to engage in remediation, reviewing the key points where students are experiencing difficulties and giving new exercises in order to improve the achievement of the objectives. This way of using school time implies a delay in the implementation of the school curriculum; as a result, many notions are not addressed during the school year due to lack of time. Failure to complete the school curriculum will have an impact on the future schooling of students. During their schooling, students who pass to the next level will be considered by their future teacher as approached all the notions of the program of the previous levels and achieved all the objectives which were to be attained. Gaps will persist and create new challenges for students as the lessons accumulate.

The teacher may also choose to continue teaching despite the persistence of difficulties for some students. However, in a program elaborated in logic by objectives, the notions are interdependent. Indeed, new lessons corresponding to new general objectives cannot generally be understood by the students without a good assimilation of the previous lessons, and a validation of the attainment of the corresponding general objectives. Moreover, without the achievement of all the specific objectives associated with the notional content of a lesson, the general objective related to it cannot be achieved. This interdependence of the objectives thus penalizes the students having difficulty on a lesson or a part of the lesson, since they will not be able to continue their apprenticeship properly without carrying out a self-remediation, since the teacher concerned with completing the school program cannot focus on redressing individual gaps. In this case, the student is left to himself and is deprived of any capacity to progress in his learning.

The interdependence of the objectives does not allow reaching the levels of analysis, synthesis and evaluation as defined by the Bloom taxonomy. So, during the progress of the teaching, students who did not achieve the objectives are penalized. Indeed, students who do not reach a specific objective will have difficulty in assimilating the notions relating to the next objective, since this assimilation requires a mastery of previous knowledge. As teaching progresses, students will have difficulty in appropriating new content, because the linking of the different notions dealt with cannot be made without assimilating all the lessons corresponding to the attainment of several specific objectives. The reinvestment of knowledge is therefore difficult, especially since it requires the linking with

the knowledge acquired in other subjects. Students are thus not able to develop a spirit of analysis and synthesis, and are unable to develop their autonomy of learning.

The absence of a process of investigation, research and the construction of knowledge during learning does not allow students to express themselves, to argue their choices and to confront their ideas; individual productions are not valued, preventing students from making proposals and taking initiatives, and developing autonomous learning; The judgment and appreciation of the knowledge they acquire are not considered to improve their level. In addition, the assessment does not take into account the process which led students to fail in achieving the objectives. This gap in the assessment also prevents the teacher from carrying out a personalized and effective remediation because it does not give him/her either the reasons for failure or the progressivity benchmarks already achieved by the student.

Moreover, goal-oriented pedagogy does not care about the contextualization of the learning of notions. The content of the program does not foresee that the student will be able to use the knowledge that he/she will have to acquire in his/her daily life; the assessment of the achievement of objectives is limited to a reinvestment of knowledge in specific school situations; the teacher is forced to adapt his teaching methods exclusively in order to adopt standardized behaviors for his students. The expected behaviors at the end of the student learning process do not therefore appear in everyday life because students have difficulty in connecting the knowledge they acquire in chemistry with the behaviors they must adopt in their everyday life in relation to their knowledge.

5. Conclusions

Goal-oriented pedagogy is a praiseworthy approach insofar as it gives an important place on the assimilation of notions. Indeed, students should appropriate the content of the lesson in order to be able to tackle the exercises. Exercises are trained to ensure that students understand what is expected of them during the assessment. For the teacher, the aim is to accustom the pupils to adopt a given behavior, depending on the situation in front of which they will be confronted. Students are thus required to retain the essential notions of each specific objective and use them to solve classical exercises.

Conditioning the student in order to achieve the specific objectives of the program makes it possible to make known to the student exactly what is expected from him, what he must learn and the exercises he must be able to solve. The teacher provides the lesson with the notions which the student must learn, and gives the corresponding application exercises. Then, the student tries to train in order to get used to answer the standardized questions which will be asked to him during the assessment. Goal-oriented pedagogy allows students to acquire the disciplinary content they must retain at the end of the program; the student thus acquires knowledge about the subject.

Whatever criticism may be made on the application of objective pedagogy, its usual form, which is the lectures, will remain a form of teaching which should be maintained in order to enable the pupil to assimilate disciplinary knowledge. However, goal-oriented pedagogy should be combined with an alternative approach which allows contextualization of the notions learned by the students, which could be the skill-based approach. With the major advances in pedagogy, especially in the area of educational technologies, the lecture can be done in several ways, including the use of video capsules to be viewed online after courses in the flipped classroom.

References

[1] Rabary, P. (2015) Arrêté n°10869/2015/MEN/SG/SLDC portant organisation transitoire de la méthode pédagogique. [Ministerial Order No. 10869/2015/MEN/SG/SLDC on the Transitional Organization of the Teaching Method]. Ministère de l'Education Nationale, Antananarivo.

[2] Loi n°94-033 du 13 mars 1995 portant Orientation Générale du Système d'Education et de Formation à Madagascar. [Law No. 94-033 on March 13th, 1995 on the General Orientation of the Educational and Training System in Madagascar].

[3] De Landsherre, G. and de Landsherre, V. (1976) Définir les objectifs de l'éducation. [Defining Objectives of Education]. P.U.F., Paris.

[4] Bloom, B.S., Hastings, J.T. and Madaus, G.F. (1971) Handbook on Formative and Summative Evaluation of Student Learning. Mc Graw-Hill, New-York.

[5] Gagné, R.M. and Briggs, L.J. (1974) Principles of Instructional Design. Holt, Rinelhart & Winston, New-York.

[6] Mager, R.F. (1975) Preparing Objectives for Instruction. Fearon, Belmont.

[7] Hameline, D. (1979) Les objectifs pédagogiques en formation initiale et continue. [Pedagogical Objectives in Initial and Continuing Education]. Editions Sans Frontière, Paris.

[8] De Landsherre, G. (1984) Empirical Research in Education. B.I.E.-U.N.E.S.C.O., Paris.

[9] Fanony, F. (1996) Arrêté n°1617/96-MEN du 02-04-96 fixant les programmes scolaires des classes de onzième, sixième et seconde. [Ministerial Order no. 1617/96-MEN on April 2nd, 1996 Fixing the Curricula of the 1st Grade of the Primary School, 1st Grade and 5th Grade of the Secondary School]. Ministère de l'Education Nationale, Antananarivo.

[10] Bloom, B.S., *et al.* (1956) Taxonomy of Educational Objectives: The Classification of Educational Goals. McKay, New-York.