

UNIVERSITY LEARNING AND LATE-ADOLESCENTS OF POST-MODERN AGES

Falicoff, C.⁽¹⁾; Pliego, O.⁽²⁾; Odetti, H.⁽¹⁾ and Bottani, E.J.^{(3)*}

⁽¹⁾Facultad de Bioquímica y Cs. Biológicas. Universidad Nacional del Litoral. C.C. 242. Paraje El Pozo. (3000) Santa Fe. Argentina. e-mail: falicoff@fcb.unl.edu.ar ; hodetti@fcb.unl.edu.ar

⁽²⁾Facultad de Cs. Exactas, Ingeniería y Agrimensura. Universidad Nacional de Rosario. Avda. Pellegrini 250. (2000) Rosario. Argentina. e-mail: pliego@fceia.unr.edu.ar

⁽³⁾INIFTA. (UNLP-CIC-CONICET). C.C. 16 Suc. 4 (1900) La Plata. Argentina. e-mail: ebottani@inifta.unlp.edu.ar

SUMMARY

In our society, the lingering instruction, the growing lack of job opportunities, and the glorification of the adolescence, are factors that contribute to the extension of this period. From the point of view of the University, the first consequence of this phenomenon is a growing proportion of late-adolescents among the student population. Even though its extension and effects are not yet known, we believe that the problem deserves to be thoroughly studied.

The main goal of this work is to determine the percentage of late teenage students at the University taking the Inorganic Chemistry course as a representative sample in our Department. This course is carried out in the last term of the first year of Biochemistry and Biotechnology careers of the Biochemistry and Biological Sciences Department. We are also interested in knowing whether this issue is connected or not to the student's academic performance.

The methodology employed consisted in a questionnaire, personal interviews, and individual observation of the students during regular classes. The instruments employed, as well as the guidelines to conduct the interviews are included as appendixes.

Two main conclusions could be derived from our study. In first place, there is an important proportion of students that fit into the category of late-adolescents. It is also concluded that being a late-adolescent affects the academic performance of the students.

Keywords: university, post-modernity, adolescent, teaching and learning.

INTRODUCTION

At our universities it is observed an increment in the number of students experiencing academic problems of different graveness. These facts called the attention of many researchers leading them to study several issues at this level of the education system. The teaching – learning process, at least in the field of Experimental Sciences, can be modified by a large number of variables. Thus there are many possible causes for the observed increasing level of failure. Among those causes we could mention emotional problems, inadequate motivation, lack of independence, wrong vocational choice, low tolerance to frustration, and excessive self-confidence.

Those authors that consider the learning process as something more complicated than a simple association between stimulus and response (training), recognize the importance of the biologic substrate to achieve a complete development of a person. They also recognize the influence exerted by cultural and social environments.

According to Rivière, Vygotski emphasizes the importance of the social environment in the development of intellectual abilities [1]. Bruner [2] recognizes the effect of the social environment too and he analyzes five strong humanizing forces: tool construction, language, social organization, human's long infancy management, and the need to explain. These items cannot be considered isolated since they are closely interrelated and could also be connected to the development of intelligence or multiple intelligences [3].

The education could be defined as the possibility, or right, of every citizen to access the intellectual capital of humanity. Because of changes in social, political, economic, and cultural environments, the adolescence tends to be extended beyond the age considered normal for previous generations. The first consequence of the adolescence perpetuation is that the individual's period of economical dependency as well as his professional education are also prolonged. These characteristics of the new generations of students must be known by the educators to better accomplish their mission.

It is more or less accepted that during the adolescence the individual is in crisis. From a positive point of view, all crises promote change thus improving the person. Without crisis, there would not be the necessary impulse to promote improvement.

Cognitive, affective, and social factors exerting a certain influence in the learning process have been analyzed [4]. Ausubel *et al* also added that those factors should be connected to the

theory and methods employed in the teaching process. The authors also considered all learning done as a receptive action, as repetition, and all learning achieved by discovery as significant.

According to Solé [5] it is not precisely known how the affective and cognitive factors interact. Neither is it known how to tamper with this relationship to benefit the global learning process. Goleman [6] pointed out that the schools and our culture are focused on the academic abilities ignoring the emotional intelligence.

In connection to group and social factors in the learning process, Ausubel *et al* [4] indicated that our adolescents have the same needs for status and social independence than the adolescents of more primitive or traditional societies. Nevertheless, the complexity of our technological society needs a larger period to educate the people who, in the meantime, continue to depend on their parents and delay marriage until many years after having reached sexual maturity. Under these circumstances, the adolescent cannot experience real independence, at least in the adult meaning of the term.

According to Rodríguez Moneo [7], the conceptual change models only take into account logical and rational factors, and are known as "cold" models. On the other hand, we can find "hot" models that assign a certain importance to these factors but add affective and vocational ones.

In our society, another factor besides a prolonged instructional period leading to an extended adolescence is the lack of job opportunities (see as example [8]). Mass media also exerts its influence by glorifying the adolescence. They also promote the idea that it is a period that must be maintained as long as it is possible.

In this context a series of questions arise: Freshman students are capable of performing the changes suggested by "cold" models? Are these students autonomous in their own learning process? Should the professors need to take into account the "hot" models?

Colombo de Cudmani [9] considers the model in which the change is a complex process of mutual readjustments that not necessarily are simultaneous.

Pozo *et al* [10] reviewed a series of papers in which the authors analyzed the relationship between certain variables and the students' performance in chemistry. Those authors grouped the studied variables into two categories, i.e. variables centered in the individual and instructional variables. In the first group, they place formal thinking, IQ, spatial reasoning, sex, and previous knowledge. The second group involve variables such as teaching styles and their relationship to

students' performance, instruction of formal thinking and the analysis of texts commonly employed in chemistry.

It is evident that, no matter which model is preferred, the problem is very complex and it is necessary to study a singular set of phenomena. This work has been inspired by the necessity to find the answers to several questions. To accomplish our task two hypotheses have been proposed:

- The extension of the adolescence period means an increase of the proportion of adolescents in college classrooms.
- This extension exerts an unknown effect on the learning performance of adolescent students that must be studied.

To validate these hypotheses an empirical study has been conducted with the following objectives:

- To estimate the proportion of students that could be considered as late adolescents.
- To look for and to establish relationships or associations between the degree of adolescence lateness and the academic performance of these students.

The study has been done with students enrolled in the Inorganic Chemistry course corresponding to the second semester of first year. Since this study has been performed in a given context, we cannot risk general extrapolations. We hope that the identification of the presence of these students will help to improve our teaching methods, to generate knowledge that will help in the development of new teaching strategies, and to provide information of the processes taking place during the transition between the secondary school and the university.

THEORETICAL BASES

"Adolescere" is a Latin word, which meant for the Romans, to grow or to become an adult. There are two classical theories (psychoanalytic and sociological) that describe this transition process. According to Coleman [11], the first theory is focused on internal factors and considers the adolescence as a period in which the person has a vulnerable personality, there is a strong tendency towards misconduct with respect to accepted standards, and assigns importance to the process of abandoning the parental home. On the other hand, the sociological theory

centers its attention on the external factors giving relevance to concepts like socialization and social role.

For the Pan-American Health Organization adolescence is a period between ages 10 and 20. The beginning of the adolescence is identified with the changes taking place during the puberty and its ending is variable depending on ethnic, cultural, and religious factors. Social position, country, time, and place are also variables that must be taken into account.

In primitive societies, the adolescence is a moment represented by the passage from one stage of life to another. In the new stage, the person becomes sexually active and acquires responsibilities within the group. In modern occidental society, a rite no longer defines the adolescence. In urban society, the adolescence is a process that last for a more or less long period and presents characteristic problems not shared with other stages of our lives. Other components of the society, lower class and countryside youth, are out of this process and the transition to adulthood is abrupt, quick, and sometimes violent due to several reasons, e.g. early paternity/maternity almost simultaneous to the beginning of active sexuality, or the necessity of finding a job. The adolescent evolves from a dependent person to an independent one whose identity enables him to interact with other people.

According to Carretero [12] the excessive importance assigned in Piaget's theory to the four stages of the development, has hidden other important aspects of his work. Moreover, the most negative consequence has been to consider that the learning process could barely modify the outcome in the sequence of the cognitive development. Considering the educational consequences of the emphasis on stages, it is possible to affirm that the professor is a mere spectator of the development, and he is somebody that helps the student in the process of self-discovery of concepts.

The stage of formal operations described by Piaget and Inhelder [13] provides the student with a series of capabilities that are necessary to make and comprehend the science. It is important to keep in mind that the teaching process aims to provide the individual with new knowledge and to modify the one already acquired. In other words, knowledge is neither a copy of the reality nor the restrictions imposed by the individual's mind completely determines it. In fact, knowledge is the product of the interaction between both factors. Therefore, the individual constructs his knowledge while he interacts with reality.

Pozo *et al* [10] concluded that formal thinking is necessary to comprehend and to employ chemistry concepts. Nevertheless, it is not enough since it has been demonstrated that formal

thinking constitutes a series of skills separately acquired and dependent on the contents of the task. Moreover, it has been questioned the very existence of a formal thinking stage since a large proportion of individuals could not be able to adequately solve formal tasks. This fact has been questioned [14] because formal thinking could be altered by variables proper of the task (e.g. nature of instructions, way in which the task is presented, and contents of the task) and variables originated in the individual that carries out the task (e.g. development stage, sex, and cognitive style).

The formal stage is also the moment in which the insertion in the adult world takes place. For many people, this is the moment to start working, and to have to confront with social life in all its magnitude; both processes normally are accompanied by conflicts and crisis. On the other hand, Delval [15] found that many adults as well as adolescents do not employ formal thinking when it should be appropriate. Thus, he questioned the fact that all adult individuals have achieved the formal thinking stage and asked whether it is achieved in all cultures. This problem remains unsolved.

Another vision is given by Coleman [11] that considers the adolescence as the stage in the vital cycle that begins in the puberty and is extended up to the moment when the individual reaches maturity. He prefers to consider the adolescence as a transition process and not as something static. The transition, according to Coleman, is the product of internal pressures (physical, intellectual, and emotional changes) and external pressures (relation with parents, friends, school, and society in a more ample sense). Coleman also points out that to understand the adolescence it is needed a theory of the normal, better than one of the abnormal. Obiols [8] preserves the idea that the adolescence is a stage of life between puberty and the moment of assumption of full responsibilities and psychic maturity. In this environment young people need more time to get prepared for a job thus they increase the number of years living in the parental home without any responsibility, using the privileges of infancy, and simultaneously enjoying of the freedom generally associated with adulthood. In other words, the adolescent achieve an almost ideal situation. Sarlo [17] agrees with Obiols and goes further by saying that today youth is more prestigious than ever.

It is possible to affirm that adolescence is not a universal phenomenon but a cultural one. Thus, its interpretation or definition must be done within the framework of culture and religion, and within them, it is necessary to take into account the social level, time, and place, in other

words, the social environment of the individual. This is the main reason why it is necessary to interpret different authors considering the context in which they worked.

PROFILE OF ADOLESCENTS

Even though the differences that can be identified among the adolescents, there is a model that could be considered as an average descriptor of adolescents. According to what has been said above, this model must be interpreted considering the environment and the moment in which it is developed.

The modern adolescent can be described as an individual living in continuous crisis, emotionally insecure, introverted, a person seeking for his identity, romantic idealist, interested in the construction of utopias, and a rebel as far as the society allowed them. These adolescents were in constant confrontation with their parents enlarging the so-called generational gap. In consequence, the adolescence was a period of large changes and losses.

The post-modern age is connected to a new stage of the capitalism based on the mercantilist view of time, culture, and life experience. According to Pérez Gómez [18], the post-modern society is characterized by a political configuration known as formal democracy, free market, and omnipresence of mass media. These characteristics determine the framework for social interaction of the new generations. According to Rifkin [19], the new human archetype is more interested in having exciting experiences than in accumulating material goods. Given the development of internet, men and women are capable of performing multiple interactions in parallel worlds, and to perform a quick personality change to self-adequate to a new reality. In this context, everything is more informal, there is no interest for traditions and heritage, and what counts is amusement in opposition to what was considered a paradigm in modern times.

It is important to note that the descriptions of the modern adolescent were constructed by their observers. In the case of post-modern adolescents, they themselves contribute to generate a description of adolescence with a large influence of mass media. In this context, it is possible to accept that there is a change in the way of being an adolescent.

Obiols [8] points out that post-modern adolescents do not feel the necessity to confront with their parents. The adolescents consider themselves as being like their parents and have no problems to live together in reasonable terms. With respect to the education that the adolescents have received, they express their agreement and that they would employ the same methodology with their own children. A similar snapshot has been obtained in Argentina by Schufer *et al* [20].

All these findings point to a necessary rethinking of the classical theories to interpret the adolescence.

Modern society valued an ideal of ego based on endless progress supported by hard work, consideration for the others, and ability to achieve his own goals. Contrasting with this vision, post-modern society promotes, especially through mass media, the values of the ideal ego: to achieve goals without effort, not to postpone his goals, and to be competitive. This means that the values of infancy are preserved during the adolescence.

The parents of our youth grown up during the 60's and developed different schemes to conduct their parenthood, a scheme different to the one of their own parents. The post-modern parents try to stay young as long as possible, now they dress like their adolescent children, they renounce to establish rigid rules to educate their children, it is not unusual to find that parents declare themselves as "friends" better than "parents" of their children. With all these conditions, parents contribute to fade the adulthood image that should be clearly differentiated from that of the adolescence.

In summary, adulthood was defined in modern society, by social recognition, achievement of social position, and economical independence. In post-modern society, the definition is fuzzy; there are continuous pressures to maintain what has been achieved, and to be economically independent.

EXPERIMENTAL ASPECTS

Within the theoretical framework described, the aim of this work is to detect phenomena associated to immaturity, and the persistence of attitudes proper of childishness. To achieve this goal, we explore socio-cultural aspects like sexuality, affections, identification models, relationship with parents, etc. The subjects of our study are students following a course of Inorganic Chemistry majoring in Biochemistry and Biotechnology.

The strategy followed to obtain the necessary data was based on three information sources: a questionnaire, an individual observation form, and a personal interview.

In what follows, we describe each data collection instrument.

1. Questionnaire

This instrument was elaborated from scratch. We looked for advice with specialists who are in frequent contact with adolescents: professors, psychologists, psychiatrists, doctors in

medicine, and students majoring in Education Sciences. We have taken into account a couple of studies on adolescents published by Schufer *et al* [20] referred to the population of Buenos Aires, and the one published by Facio *et al* [21] referred to adolescents of Paraná (Entre Ríos Province).

The analysis of the obtained data allowed us to identify the relevant variables and, in some cases, the relationship between them. In this way, we could generate a global image of the main characteristics of our adolescents. The most relevant aspects analyzed in our study include self-image, family, school, social interaction, and health.

The questionnaire showed in Appendix 1 is the final version of the employed instrument. In the elaboration of this instrument we have taken into account the suggestions made by Cohen and Manion [22]. The questions were placed in random order thus all the investigated areas were distributed along the whole questionnaire. Items 1 to 7 cover personal data; items 15 to 20, 30, and 43 are related to the self-esteem; items 21 to 29, and 31 inquire on family matters. Items 32 to 41 cover the emotional aspect; friendship is covered with items 44 to 46; items 8 to 14 concern study; and finally, item 42 inquires on the economical situation of the student.

Several aspects, considered more important, were repeated using different descriptions. The questionnaire contained 46 items mostly multiple-choice questions.

To code the results we have assigned "A" to any answer showing a large degree of maturity and "a" to an answer exhibiting a degree of immaturity. If the answer could not be clearly assigned to any class, we marked it as "aA". The result was expressed as percentage of "A" and "a" answers giving an idea of the profile of the person. We also analyzed our results to find out if a larger proportion of "A" answers correlates with a better performance of the student. Finally, we also studied whether a larger proportion of "a" answers has any relationship with the learning performance of the Inorganic Chemistry course.

To be more precise, an answer is graded as "A" when it suggests: individuality, adequate relationship with parents, self-government, certain degree of self-esteem, equilibrium between personal and other people's interests, ability to socially interact with the opposite sex, recognition of the existence of rules and to accept them, ability to perform complex tasks that are of his/her interest.

2. Individual Observation Form (IOF)

The IOF was elaborated following the directives published elsewhere [23]. The main goal pursued with the IOF was to collect data through a direct contact with the subject in specific and

controlled situations. The IOF was completed during classes conducted in the laboratory. A model of the IOF is included in Appendix 2.

3. Personal interview (PI)

The PI was conducted according the guidelines published by Colás Bravo *et al* [24]. During the PI the subject is expected to express his own ideas as freely as possible. The PI looks for information concerning the subject perceptions, point of view on several items, and personal experiences. The PI are not open but directed by the interviewer. The main guidelines to conduct the PI are summarized in Appendix 3.

RESULTS

The students employed as subjects in this study have been selected by the authors. A group of 33 students (21 female and 12 male) were selected during a laboratory class. We have analyzed the group and the individuals. The questionnaire was distributed at the beginning of the class during the second week of the course. The students distributed themselves in the laboratory as they were doing for previous classes. Approximately 20 to 25 minutes were enough to complete the questionnaire. Most of the students were surprised by the inclusion of personal questions.

The evaluation of the questionnaires according to the criteria previously explained produced the following results: 63.7% of the students had more than 70% of "A" answers, and 36.3% had less. In view of this result, the group is divided into two, one showing a larger maturity degree. Four subjects from the mature group, the ones exhibiting the largest proportion of "A" answers, were selected. Another 4 subjects were selected from the less mature group, the ones having the largest proportion of "a" answers. If two subjects presented the same proportion of a given kind of answer, the one showing contradictory answers was excluded. Moreover, it was our original idea to have equal number of women and men in each group but it was impossible, thus the groups were finally constituted by 3 women and only one male subject.

The IOF was completed during regular classes in the laboratory. To avoid a biased observation it was repeated in three different days for each student and by different professors. Thus, each student has three IOF completed by different observers. For the experimental class, the students distributed themselves in the laboratory usually forming groups of 2 or 3. During the observation period we collected as much data as possible concerning the students' attitudes and

activities. The analysis of the IOF produced results in agreement with what was found with the questionnaires.

The next step in our study was to select from this group 4 students, two having the strongest "A" character and two having the strongest "a" character. Afterwards an additional personal interview was maintained with each student in an effort to gather more data.

To keep reserve on the identity of the students we have replaced their names with pseudonyms. Table 1 shows each name and the group to which they belong.

Table 1: *Pseudonyms, category, and grades of each student selected. The grade scale runs from 0 to 10 and the minimum to pass a test is 4.*

() Alan has not yet passed the experimental class test, thus he cannot present the final test.*

Name	Category	Experimental Classes grade	Final grade	Number of times to pass the final test
Anastasia	A ₁	6.05	5	3
Alexander	A ₂	6.20	6	1
Anne	a ₁	4.18	5	3
Alan	a ₂	3.50	(*)	0

The extra personal interview was conducted during a regular class, in a quiet environment, and notes were taken instead of recording the interview. Each interview of approximately 15 minutes, was kept informal within logical limits. The students showed good disposition toward the interview and the professor conducting it. During the interview, both Anne and Alan demanded "more explanations", which must be interpreted as a demand of more elaborated concepts relieving them from part of the effort needed to apprehend new concepts. In view of this demand it is clear that is not by chance that Anne and Alan belong to the "a" group. In agreement with this result, the IOF showed that both exhibited a passive attitude during laboratory classes. One common complaint expressed by the interviewed students, concerned an "overloaded timetable". They considered that they have many courses each semester and this leaves insufficient time to study.

Other comments or complaints were referred to certain aspects of the regime that are almost exclusive of the Argentine College regime, thus they are not included here.

Another source of information was the record that the professors keep of each student covering their performance in tests, how many classes they missed, the quality of their reports, etc. Table 1 includes this information that we employed to characterize the academic performance of the students. A quick analysis of the data presented in Table 1 indicates that there is a relationship between the academic performance and the degree of adolescent character of the students.

Anastasia and Alexander showed a certain degree of mastering studying techniques, despite their failures, they overcame the situation with more study and effort and finally they achieved their goal: to be promoted. They also showed more or less clear ideas about their future professional activities or about what they expected to achieve.

We consulted also the records kept by the Students Department of the University and found that the four students are still active students, nevertheless, Anastasia and Alexander exhibited better performances than Anne and Alan, and that they also were, at the moment of writing this paper, more advanced in the career.

CONCLUSIONS

The employed methodology to conduct this study did not show any kind of limitation with respect to the evaluation step and to possible replications of the study.

Our results show that a portion of the students in College exhibit the characteristics of late-adolescents.

It seems that a stronger adolescent character of the student implies a lower academic performance. Nevertheless, our study does not allow us to make any prediction of the behavior of a given student in a different context or with a different task.

Our analysis of the performance is very limited since it is a fact that student's performance is mostly based on the grades obtained, and that grades are obtained demonstrating conceptual knowledge.

There are other aspects that are not taken into account that has been demonstrated contribute to determine the performance of a subject to accomplish a given task. In this aspect is important to review other authors' opinions [5, 25].

REFERENCES

- [1] Rivière, A. *La psicología de Vygotski*. Visor, Madrid. **1988**
- [2] Bruner, J. *The relevance of education*. W.W. Norton and Co. Inc., New York. **1987**
- [3] Kwen, B.H. "Applications of Multiple Intelligences Theory to Chemistry Teaching and Learning". *Chem. Ed. Inter.* 3(1), AN-6, **2002**
- [4] Ausubel, D.P.; Novak, J.D.; Hanesian, H. *Educational Psychology: A Cognitive View*. Holt, Rinehart and Winston. **1983**
- [5] Solé, I. "Disponibilidad para el aprendizaje y sentido del aprendizaje". In Coll, C.; Martín, E.; Mauri, T.; Miras, M.; Onrubia, J.; Solé, I.; Zabala, A. (Editors) *El constructivismo en el aula*. 6th Edition. (pp. 25-46). Graó de Serveis Pedagògics, Barcelona. **1997**
- [6] Goleman, D. *Emotional Intelligence*. Bantam Books. **1996**
- [7] Rodríguez Moneo, M. *Conocimiento previo y cambio conceptual*. Aique, Buenos Aires. **1999**
- [8] Obiols, G.A.; Di Segni de Obiols, S. *Adolescencia, posmodernidad y escuela secundaria. La crisis de la enseñanza media*. Kapelusz, Buenos Aires. **1996**
- [9] Colombo de Cudmani, L. "Ideas epistemológicas de Laudan y su posible influencia en la enseñanza de las ciencias". *Enseñanza de las Ciencias* 17(2), 327-331, **1997**
- [10] Pozo, J.I.; Gómez Crespo, M.A.; Limón, M.; Sanz Serrano, A. *Procesos cognitivos en la comprensión de la ciencia: las ideas de los adolescentes sobre la química*. Centro de Publicaciones del Ministerio de Educación y Ciencia (CIDE), Madrid. **1991**
- [11] Coleman, J. *The Nature of Adolescence*. Methuen Et Co. Ltd, London. **1985**
- [12] Carretero, M. *Constructivismo y educación*. Aique, Buenos Aires. **1993**
- [13] Piaget, J.; Inhelder, B. *La psychologie de l'enfant*. Presses Universitaires de France, París. Spanish version: *Psicología del niño*. Morata S.A., Madrid. **1969**
- [14] Carretero, M.; Palacios, J. y Marchesi A., Eds. *Psicología evolutiva 3. Adolescencia, madurez y senectud*. Alianza, Madrid. **1985**
- [15] Delval, J. *Crecer y pensar: la construcción del conocimiento en la escuela*. 3rd Edition. Paidós, Barcelona. **1994**
- [17] Sarlo, B. *Escenas de la vida posmoderna: intelectuales, arte y videocultura en la Argentina*. 3rd Edition. Ariel Espasa Calpe, Buenos Aires. **1994**
- [18] Pérez Gómez, Á.I. La socialización postmoderna y la función educativa de la escuela. En Angulo Rasco, J.F.; Sacristán, J.G.; López Melero, M.; Pérez Gómez, Á.I.; Santos Guerra, M.A.; Torres Santomé, J.; *Escuela pública y sociedad neoliberal*. Actas de las IX Jornadas de formación de profesorado del sindicato de enseñanza de CGT. Edita Aula Libre, Málaga. **1997**

- [19] Rifkin, J. *The Age of Access*. Putnam Inc., New York. **2000**
- [20] Schufer, M.; Mendes Diz, A.M.; Teisaire, A.M.; Estrugamou, M.; Climent, A. *Así piensan nuestros adolescentes*. Ediciones Nueva Visión, Buenos Aires. **1988**
- [21] Facio, A. y Batistuta, M. *Los Adolescentes y sus padres. Una investigación argentina*. Facultad de Ciencias de la Educación, Universidad Nacional de Entre Ríos, Paraná, Argentina. **1997**
- [22] Cohen, L.; Manion, L. *Research Methods in Education*, 3rd. ed., Routledge, **1989**.
- [23] Cavendish, S.; Galton, M.; Hargreaves, L. y Harlen, W. *Observing Activities*. P. Chapman, London. **1990**
- [24] Colás Bravo, M.P.; Buendía Eisman, L. *Investigación Educativa*. 3.^a Edition. Alfar, Sevilla. **1998**
- [25] Colombo de Cudmani, L.; Pesa, M.A.; Salinas, J. "Hacia un modelo integrador para el aprendizaje de las ciencias". *Enseñanza de las Ciencias*, 18 (1), 3-13, **2000**

APPENDIX 1

QUESTIONNAIRE

It is our intention to conduct a study of socio-cultural aspects of students doing Inorganic Chemistry majoring in Biochemistry and Biotechnology. If you agree to fill out this form it will be very important to have your opinion. Please, mark with a cross only one option, except when indicated otherwise. Do not leave any question without an answer.

- 1) First and Last Names:
- 2) Age:
- 3) Marital status:
- 4) Place of residence (just the city or town):
- 5) Place of residence of your family (just the city or town):
- 6) Which career are you majoring on?
- 7) When have you began College?

- 8) You choose this career because:
It has good job opportunities
My friends are here
It is my vocation
As a suggestion of my parents

- 9) Which study strategy do you employ most frequently (mark just one):
Writing summaries
Underlying the textbook
Reading
Memorizing
None

- 10) You study from:
Notes
Books
Both

- 11) Did you have problems with your study performance?
Yes
No

- 12) How did you solve those problems?
With help obtained in my family
With help obtained from a professional
Studying harder
I have not solved it

- 13) How could you define your relation with your classmates?
Very bad

Bad
Good
Very good

14) How could you define your relation with your professors?

Very bad
Bad
Good
Very good

15) Your opinion about yourself, changes or it is always the same?

Changes a lot
Changes a little
Changes very little
Does not change

16) The person you admire the most is:

Because:

17) Do you think that your personality has good qualities?

I strongly agree
I agree
I disagree
I strongly disagree

18) Your physical height seems to you:

Adequate
Inadequate

19) Your physical appearance seems to you:

Very nice
Nice
Ugly
Very ugly

20) Your weight seems to you:

Adequate
Inadequate

21) Considering the majority of subjects, your parents and you

Agree very often
Agree often
Disagree
I do not know my parents' ideas

22) Do your parents know your friends?

All of them

The majority of them
Some of them
None of them

23) How do you consider your relationship with your parents?

Very bad
Bad
Good
Very good

24) How often do you participate in your family conversations?

Always
Very often
Seldom
Never

25) How much interested are the other members of your family in knowing your opinions during those family conversations?

Very
More or less
Little
I do not know if they are interested
They do not care

26) Do you have arguments with your parents?

Very often
Sometimes
Almost never
Never

27) How do you consider your relationship with your mother?

Very bad
Bad
Good
Very good

28) Do you feel understood by your parents?

Always
Almost always
Almost never
Never

29) With respect to what is good or bad, correct or incorrect, decent or indecent, your parents and you:

Agree a lot
Agree many times
Think the opposite
I do not know

30) I have a good opinion about myself.

I strongly agree

I agree

I disagree

I strongly disagree

31) Which of the following sentences describes better your relationship with your parents?

They are too much absorbing and control everything

They care about me in the measure I need

They charge me with too many responsibilities

They give me responsibilities according to my age

32) Thinking on your future as an adult:

I feel optimistic, trustful

I am worried, fearful

I feel pessimistic

I do not know

33) Human beings really like to help other human beings:

I agree

I disagree

34) Most of the time you feel:

Very pleased

Pleased

Unhappy

Very unhappy

35) Are you worried for your nerves?

Very often

Sometimes

Seldom

Never

36) Do you think about which kind of person will you be in the future?

Very often

Sometimes

Seldom

Never

37) Your main worries are: (assign a number from 1 to 3 in order of priority)

My boy/girlfriend

My friends

My clothing

My study

Money

My amusement

38) To weak up in the morning:

You ask somebody to weak you up

You use an alarm clock

You are always oversleep

You weak up without help

39) Do you keep yourself informed through newspapers, tv, radio, magazines, etc?

Always

Almost always

Seldom

Never

40) Do you think that:

You can trust on the majority of the people

You cannot trust too much on other people

41) Concerning drug consumption by adolescents, you think that:

It is exaggerated its prohibition

It is dangerous

It is a personal problem

It must not be consumed

42) How do you obtain your money?

Asking my parents every time I need

I have a monthly allowance

I have a job

43) Generally speaking, you are satisfied with yourself

I strongly agree

I agree

I disagree

I strongly disagree

44) About friendship (mark just one option):

It is hard to obtain and to keep

It is necessary and important for all human beings

It is happiness

It is more important at this age than at other stages of life

It is impossible to find because you are deceived or you are left aside

It is something that you must care to improve it everyday

45) Your easiness to make friends is:

Very large

Large

Little

Very little

46) As part of your life, your group of friends is:

Very important

Important

Regular importance

Low importance

APPENDIX 2

INDIVIDUAL OBSERVATION FORM

FIRST AND LAST NAME:

CAREER:

COURSE:

ACTIVITY: LABORATORY CLASS

GROUP N°:

NUMBER OF STUDENTS:

WORKING SITUATION:

Alone

Group of students of the same sex.

Mixed group of students.

INTERACTION WITH CLASSMATES:

Good

Scarce

Non-existent

PARTICIPATION IN THE ASSIGNED TASK:

Just observes

Leads the group

Cooperates

Does not participate

Dominates

Other

KIND OF PARTICIPATION IN CLASS:

Discusses observations, plans, and recipes

Just copies from the blackboard

Interprets

Presents hypothesis

Plans

Annotates (not copy)

Does not participate

Other

REACTION FACING FAILURE:

Fury

Perseverance in work, hope, optimism (self-motivating)

Resignation, passivity, apathy, pessimism

Other

ATTENTION ON THE WORK

Pays attention to the professor

Pays attention to other students

Does not pay attention at all

RESPONSABILITY

Accomplishes with the assigned task

Does not accomplish the assigned task

DOES HE MAKE QUESTIONS (asking for help)

Yes

No

DOES HE MAKE QUESTIONS (research)

Yes

No

APPENDIX 3

GUIDELINES TO CONDUCT THE PERSONAL INTERVIEW

- Which were your expectations at the beginning of the course?
- The course, do you like it, is it attractive, or you do not like it at all?
- Intellectually speaking, the course produced any change in you or it has been irrelevant?
- How do you study?
- With respect to the first partial test, what happened? What do you feel? Which are your goals now?
- How is your relationship with your classmates?
- How is your relationship with the professors?
- The working environment, is it good? Have you had positive or negative experiences?
- Which are your expectations about your career? Future?
- Do you have any proposal?