

A study about Students' Knowledge at the National University of Education of Ecuador

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Abstract. The current study examines the situational state of knowledge students' present prior the beginning of the subject entitled "Participatory action research: History of life" and their evolving process while the course advances. These undergraduates are studying at the second semester of Basic Education at the National University of Education of Ecuador. Students are organized in four groups, corresponding to the second semester of the year 2017 and, the first semester of 2016 and 2017. The central axis of this research is to explore the starting point of the cognitive basis students present regarding fundamental knowledge of the subject at the beginning of the semester and its progress and final assessment at the end of the course. To achieve these objectives, an instrument, articulated in three content modules, has been developed. The results obtained show the existence of significant changes in the acquisition of the explored knowledge.

1. Introduction

This study intends to detect the prior knowledge a group of students' present at the moment they start their university term and, verify its evolution at the end of the same semester. Its purpose is not exclusively limited to recognizing the starting point of previous knowledge and its dynamics, but it also aims to obtain indicators which would enable teachers to activate appropriate pedagogical strategies that encourage meaningful learning.

From the conceptual point of view, the term "ideas or previous knowledge" makes reference to those conceptions that students have acquired about different knowledge: both, those constructed from systematic teaching external experiences and, those created in educational processes [1]. The procedure used in order to gather and address the state of knowledge has been detailed through a diagnostic assessment which was applied before starting the new phase of learning with the dual purpose of knowing what these students know about what is required and making decisions which will strengthen their educational process [2].

Studies focused on this type of analysis have their antecedents in the last third of the 20th century [3], although it would not be until Ausubel's theory about "meaningful learning", and the importance of previous knowledge (1963), when it begins to acquire a broad development as the foundation of the significance in learning. Later, Viennot (1976) and Novak (1982) approach similar studies where they emphasize that students, before accessing formal instruction, develop ideas which will prevail

after the formal education phase. However, as collected in different analysis, that previous knowledge is not always an epistemological obstacle that hinders the later provided instruction, because, in certain occasions, this simply represents an incomplete or erroneous understanding.

In both above mentioned situations, the teacher's support seems to be the key to trying to reverse this situation by introducing various mechanisms and instruments, as far as information is available. This proposal is addressed in this direction: check the students' previous knowledge on the subject at the initial and final phases of the academic term which will allow a self-reflective exercise on the teaching practice itself. In these last decades a rich scientific production has been generated and there is a generalized consensus on the relevant role played by previous knowledge in the learning process and its influence in the construction of new meanings.

The practice of the teacher's appropriation of the previous ideas is not very generalized in the classrooms and, in general terms, these learning processes and the teaching work are based on other teacher's previous ideas and not those of the students' themselves [4]. This context often leads to an insurmountable obstacle between apprentice and teacher. On the other hand, the teacher's appropriation of that previous knowledge students possess provides a source of information of great validity and a consistent indicator, not only to know the starting situation, the sequence of learning prerequisites, and the possible failures, but also to allow acting on the foundations of the learning process and enabling an immediate intervention through different learning activities [5]. So that prior knowledge becomes a valuable variable to be taken into account for the new learning process and, therefore, it is essential to assess what the student knows at the time of starting a new learning stage.

2. Materials and methods

The necessity to count with data regarding students' prior knowledge in the process of acquisition and construction of new concepts, has led to various technical diagnostic proposals. In this case study presented, a pre-test / post-test quasi-experimental design has been chosen with groups formed and, therefore, not randomly selected [6] and by the elaboration of a mixed questionnaire, which integrates open, closed questions with others of multiple options. From this perspective, a questionnaire has been created in order to evaluate the starting point of a group of students in two semesters. The scope of this research focuses on the study of basic conceptual elements of the subject: at the beginning of the course the proposed instrument is applied and, by the end of the semester, its application is repeated, although presenting a single change in one of its variables. In this way we can observe the group evolving process as well as the individual evolution and assess the incidence performed by the teacher.

The questionnaire is structured in three content modules with their corresponding study variables. The first module, identifying data, is dedicated to certain students' socio-demographic characteristics. A second group of variables explores the reason why students selected their Education major at the university, students' knowledge about the specific pedagogical model of the university center, students' expectations and, assessment of the subject. The third module analyzes the knowledge variables, general concepts on the subject and others related to the researching process.

The information was collected during class time and applied for the period of the last semester of 2016 and the first semester of 2017, formed by four groups of "Life History" of the 2nd term of the Basic Education major at UNAE. The following section presents the results of the descriptive analysis per percentage by variable and, the t statistical test has also been applied for the samples related to the purpose of identifying significant differences between the obtained answers to the two questionnaires. The software R v.3.2.5 was used for the statistical analysis.

3. Results and argumentation

3.1 First module: characterization of the student analyzed population

The investigated group of students' geographical origin presents a predominant figure in Cañar parish where the university is located, and its bordering neighbors, Azuay, which provide the highest percentage of student representation in this institution.

The first group, formed by the students of the 2nd Semester of 2016, is formed by 55 students from which 51% are women and 49% are men, whose ages are grouped in two intervals: 71% between 18 and 22 years old and 29% are 23 or older, where the average age is 21 years old.

The second group, integrated by the students of the 1st Semester of 2017, is composed of 49 students and distributed by 49% women and 51% men grouped in two age groups: 59% between 18 and 22 years old and 41% are 23 or older, being 22 the average age.

A distinctive feature in regards to the educational origin of the legal nature of the schools before university, is that more than 3/4 of the students come from public high-schools. While between 18% to 14% come from private high-schools, and a lower percentage of legal mixed institutions (private schools financed by the Ecuadorian government).

In relation to the marital status of these learners, a high percentage of students are single, between 89% in the 1st term of 2017, 88% 2nd term of 2017, and 88% respectively; however, between 8% and 11% present family responsibilities.

From the point of view of ethnic self-recognition, between 98% and 100% are defined as mestizo (mixture between white and native Southamerican races).

3.2 Second module: motivation in career choice, knowledge of the pedagogical model, expectations of the subject and assessment

Two relevant aspects draw attention to the obtained results: on the one hand, the immense majority of the students, object of the current study, are adjusted to the criteria and values that should prevail in the choice of the reasons why to become professionals in their fields of study and, secondly, a clear correspondence between the answers offered in the previous and subsequent tests is observed.

From a different perspective, this module tries to detect the previous knowledge that these students present about the Pedagogical Model of their university centers through two questions: one closed, where the questions states "if you know" or "if you do not know" the educational model, and another open question, where a written explanation is required about "your ability..." in this regard with the idea of verifying the previous response.

Regarding the group of students in the second semester of 2016, it can be observed that in the pre-test phase, 70.91% of them answered that they knew the Pedagogical Model and in the post-test that result was increased up to 95%. Thus, despite the high initial knowledge, this variable undergoes a significant change, since the value provided by the statistical *t test* is 0.000.

While the group from the first semester of 2017, in the pre-test phase, 76% answered that they know the Pedagogical Model and in the post-test that result is increased up to 90%, which also translates into a significant change (0.018).

With the idea of verifying this information, it was requested to the students to provide a definition for the pedagogical model, then it could be observed that the first group in the pre-test only 3.64% responded adequately and this percentage increased to 10.91% in the post -test. While partially adequate answers in the pre-test were 49.09% and in the post-test they increased to 76.36%. Whereas, inadequate responses in the first phase offered 18.18% and fell to 7.27% in the post-test. However, we must point out that 29.09% did not apply in the pre-test and 5.45% in the post-test. In any case, it should be noted that significant changes confirmed by the *t test* (0.000) are also observed in this variable.

While in the 2nd group of students it is determined that not a single student responded adequately during the pre-test. On the other hand, in the post-test, 41% answered correctly. While partially adequate responses remained stable at 53%, both in the pre-test and post-test, and inadequate responses fell from 47% to 6% in the post-test. This evolution also offers significant changes confirmed by the index obtained in the *t test* (0.000).

3.2.1 Initial expectation on the subject

One aspect that we were interested in finding out was focused on the expectations generated by the students on the subject at the beginning of the semester. In this case, the main expectations for both semesters were: "Learn to put it into practice", "improve skills for a professional future" and "train to investigate". These and the set of expectations outlined show, in our opinion, a definite degree of maturity from the students' part.

3.2.2 Assessment in regards to the teaching of the subject

If it was important to find out the students' expectations in the initial moments, it would be no less relevant to know their assessment of the training process received at the end of the cycle. The results of the evaluation made to the students is positive, although this does not prevent a reflection on the possibility of activating a greater diversification in the actions.

3.3 Third module: conceptual assimilation

3.3.1 Assimilation of the research-action concept

The indicator obtained by the students of the 2nd semester of 2016 about this concept in the pre-test offers a highly perturbing data, since only 1.82% of students demonstrate knowledge capacity. While 61.82% offer a partially adequate response and 36.6% do not possess conceptual mastery. However, the data recorded in the post-test provide an increase in the appropriate responses (14.55%) and a decrease of 22 points in the inadequate ones. However, it grows in almost 10 points partially adequate.

While the result of the students of the 1st semester of 2017 in the pre-test phase offers some negative data, since only 2% of the students demonstrate to have knowledge capacity. While 62% offer partially adequate answers and 36% do not possess conceptual mastery. However, the post-test provides an increase in adequate responses. As a result of this evolution, the obtained index registers a change in the conceptual assimilation in the statistical *t test* (0.000).

3.3.2 Assimilation of the purposes pursued by the action research

The indicator of knowledge about the purposes of action-research from the students of the second semester of 2016 in the pre-test also throws another alarming data, since only 1.82% responds adequately. While those that respond partially adequately and inadequately are distributed with a very similar weight, between 54.55% and 43.64% respectively. On the other hand, the evolution of these data in the post-test draws a significant reduction of inadequate responses, from 54.55% to 23.64%; a high growth of partially adequate ones that reaches 30%; and a scant growth of 1.82% in the appropriate ones.

In a similar way, the indicator obtained by the students of the 1st semester in the pre-test also offers a disturbing fact, since only 2% respond adequately. While partially adequate and inadequate responses are distributed with 63% and 35% respectively. On the other hand, the registration of these data in the post-test draws a significant reduction in inadequate ones, from 35% to 6%; a high growth in the adequate ones that reaches 33%; and a decrease of two points in partially adequate ones. In such a way that the data obtained in the statistical *t test* (0.000) shows a significant advance in this learning process.

3.3.3 Assimilation on the phases of an investigation

This indicator of knowledge about the phases of a research in the students of the 2nd semester of 2016 is the only variable where the percentage obtained in the pre-test provides a highly positive data, since 27.27% responds appropriately, at the time, that inadequate responses are at 30.91% and partially adequate responses represent 41.82%. The post-test data shows a significant increase in assimilation, 52.73%, and a decrease of almost ten points respectively in the partially adequate and inadequate responses.

In regards to the first half of 2017, the same previous trend is repeated, with a percentage in the highly positive pretest: 24% respond appropriately, while inadequate responses are 47% and partially adequate responses represent a 29%. These percentages are improved in the later phase with a growth in assimilation that reaches 65%, a decrease of eleven points in the partially adequate answers and a

decrease of 31 points in the inadequate ones. In this way, the t (0.000) test shows the significant existence of conceptual assimilation.

3.3.4 Assimilation on qualitative-quantitative research concepts

In this case the predominant indicator of the students of the 2nd semester of 2016 corresponds to the partially adequate answers, which is placed with a relevant weight, both in the pre-test and post-test, with 74.55% and 81.82% respectively.

Also, this precariousness in regards to this conceptual domain is evident in the students of the first semester of 2017 with a null representation of the appropriate answers, with 61% of partially adequate and 39% inadequate in the pre-test. However, in the post-test phase a relevant transformation takes place, since 47% of the answers are adequate, 49% partially adequate and 4% inadequate. This evolution is translated into the index of the t test (0.000) that confirms a marked change in learning.

3.3.5 Assimilation on the concept of Historia de Vida (Life Story)

The indicators of knowledge on the concept of Life History of the students of the 2nd semester of 2016 in the pre-test register an almost balanced percentage distribution between partially adequate responses (54.55%) and inadequate responses (43.64%), whose indexes are predominant compared to the appropriate answers (1.82%). However, that curve changes dramatically in the post-test, where the right responses experience a growth of almost 35 points, while a significant decrease in inappropriate responses occurs by 38%. While the partially adequate ones present percentages similar to those obtained in the pre-test.

While the students of the 1st semester of 2017 in the pre-test register a low percentage of adequate answers, 14%, 53% of partially adequate and 33% inadequate. However, there is again a change of trend in the post-test, where the right answers grow 57 points, while the partially inadequate ones decrease 24 points and the inadequate ones are reduced by 33 points. Thus, the index offered by the t test (0.000) points towards a significant conceptual learning.

3.3.6 Assimilation on the instruments used in the construction of Life Story

This variable presents very similar indicators to the evolution described in the preceding paragraph in the group of the second semester of 2016, although with a higher level of growth in the appropriate answers, which rise 53 points; a considerable decrease of the inadequate ones, that go down 60 points; and a percentage stability between 30.91% and 38.18 between both measurements in the partially adequate responses.

The students of the first semester of 2017 present acceptable previous indicators, with 31% of adequate answers, 41% partially adequate and 29% inadequate. While its tendency in the post-test indicates a substantial advance of the adequate responses that grow 40 points, a decrease of 17 points in the partially adequate ones and a decrease of 25 points in the inadequate ones. As a result of this evolution, the t (0.000) test confirms the existence of a significant change in its conceptual assimilation.

3.3.7 Assimilation of the hypothesis concept

This is another one of the indicators of the students of the 2nd semester of 2016, which in the pre-test phase present unbalanced indexes between the partially adequate answers in regards to the adequate and the inadequate ones, with a predominance of the first, which reaches 80% compared to the second, with 5.45%, and the inadequate ones with 14.55%. On the other hand, the data obtained in the post-test, in spite of an increase in both adequate and inadequate responses, grew almost 50% in both, but did not counteract the growth of almost 4 points of the partially adequate.

The students of the first semester of 2017 present some indicators in the pre-test phase that show a limited conceptual mastery, as only 8% of the answers are adequate, 65% partially inadequate and 25% inadequate. In the same way as in the previous cases, the results obtained in the post-test come to register a growth of 23 points in the successful ones, a decrease of 10 points in the partially adequate ones and a decrease of 13 points in the inadequate ones. So the value thrown by the t test (0.000) verifies a significant change in learning.

4. Conclusions

The profile of the students studied shows certain similar characteristics: most of them come from the main geographical area where the university is located and its near surroundings. It is observed that the ages of the students, in relation to the semester cycle they attend, are higher than what is expected for students who study second semester at university. A proportional balance of gender is evident among the studied students; most come from public educational schools. The majority of students present a civil marital status legally informed as single and 10% have family responsibilities. Finally, ethnically a self-defined student hegemony as a mestizo is confirmed.

A second detected aspect shows the existence of a high degree of motivational maturity at the time of choosing their University careers, at the same time that they express certain expectations about the subjects and a positive evaluation along with a strong lack of the pedagogical models of their university centers.

Another characteristic, referred to the previous state on the cognitive and scientific basis, is the difficulty presented by the analyzed students in the understanding and application of basic scientific knowledge. Overall, it can be said that the percentages of adequate answers referred to the conceptual module in the pre-test offer low indexes. On the other hand, this situation, after the final phase of the semester time learning process undergoes a remarkable transformation reflected in a significant substantial advance in the conceptual and knowledge domain of the subject.

This evolution indicates that, at least, there has been learning of the target knowledge throughout the semester and, therefore, the work done by the teacher through the different didactic-practical approaches designed together with the applied stimulus actions have been able to develop some incidence in this learning process. It has not being able to clearly specify its dimension, although it has also led to the conclusion of deepening on this teaching experience in subsequent cycles. Therefore, independent of the teaching strategic approach used, there is also a dynamic process of percentage growth in learning and a significant change.

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