



Construcción de una prueba objetiva para la medición del rendimiento académico del alumnado del Grado de Pedagogía

Construction of an objective test for measuring academic performance of the students of the Degree in Pedagogy

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RESUMEN.

El objetivo general de este trabajo es construir una prueba objetiva para la medición del rendimiento académico del alumnado del Grado de Pedagogía de la Universidad Complutense de Madrid. Para ello se ha utilizado metodología cuantitativa, adoptando un enfoque estructurado que permita identificar los patrones generales que caracterizan a nuestra población. Se comenzó con una ponderación de la importancia relativa de cada uno de los temas o contenidos de la asignatura y, a continuación, se determinó el número de ítems de la prueba para después repartirlos teniendo en cuenta la importancia relativa de cada tema. Los resultados muestran que prueba medía con precisión el rendimiento del alumnado del Grado en Pedagogía, en una de las asignaturas obligatorias del plan de estudios. Como futuras líneas de investigación, se sugiere la construcción de otras pruebas similares para otras asignaturas y cursos del grado de Pedagogía así como contrastar los resultados de los estudiantes con otras mediciones acerca de la autoeficacia de los propios docentes, por su estrecha relación con el rendimiento académico de los estudiantes.

PALABRAS CLAVE.

Rendimiento académico, universidad, Pedagogía, medición, prueba objetiva.

ABSTRACT.

The general scope of this work is to construct an objective test for the measurement of the academic performance of the students of the Degree in Pedagogy of the Complutense University of Madrid. For this, quantitative methodology has been used, adopting a structured approach that allows identifying the general patterns that characterize our population. We began with a weighing of the relative importance of each of the subjects or contents of the subject, and then the number of items in the test was determined and then distributed, taking into account the relative importance of each topic. The results show that the test accurately measured the performance of the students of the Degree in Pedagogy, in one of the compulsory subjects of the curriculum. As future research lines, it is suggested the construction of other similar tests for other subjects and courses of the degree in Pedagogy, as well as contrasting the results of students with other measures about the self-efficacy of the teachers themselves, for its close relationship with the academic performance of the students.



Fecha de recepción: 31-10-2017 Fecha de aceptación: 20-11-2017

Salas-Rueda, R. (2018). Perspectivas de los estudiantes sobre la inclusión de videojuegos en el aprendizaje *International Journal of Educational Research and Innovation (IJERI)*, 10, 232-242

ISSN: 2386-4303



**KEY WORDS.**

Academic performance, university, pedagogy, measurement, objective test.

1. Introduction.

Despite being a widely studied construct (Cortez, Tutiven and Villavicencio, 2017; García, 2014; Moral, 2006; Live Nicolas and Sanchez, 2004), the multidimensional nature of academic achievement means that there is no agreement among specialists when defining a single approach in the available literature. (Gonzalez case, Diaz and Lopez, 2012). In an investigation by Navarro (2003) in which we consider the different theoretical perspectives - methodological on academic performance, the variable is conceptualized as there is a capacity "of adopting quantitative and qualitative values construct, through which there is an approach to the evidence and dimension of skill profile, knowledge, attitudes and values developed by the student in the teaching - learning process"(p. 12 -13).

The measurement of student academic performance alone is not synonymous with improving the quality of education. However, it represents an essential tool for making decisions to improve the teaching-learning process (Alfageme, 2009; Guerra-Martín, Lima-Serrano y Lima-Rodríguez, 2017; Rodríguez, Muñoz y Castillo, 2014).

In the present article a process of building an objective test for measuring exposed the performance of the students of the Degree in Pedagogy of the Complutense University of Madrid in the subject Sociology of the Educational System. This is a compulsory subject that is taught to 2nd grade students with the objective of understanding the complexity of the educational phenomenon and the contribution of the different disciplines, sciences and techniques for their study.

For the construction of the objective test it has followed the model established by García Ramos (2012). First, the planning process will develop testing. Then the construction of the measuring instrument will be exposed. Finally, conclusions will arise about the objective validation test.

This study is part of a broader work carried out within the framework of the Project for Innovation and Improvement of Teaching Quality "The indicators of quality and excellence in university teaching. Study, selection and design of methodological resources" of the call for the Vice-Rectorate of Evaluation of the Quality of the Complutense University of Madrid.

2. Goals.

The general objective of this work is to construct a test for the measurement of the academic performance of the students of the Degree of Pedagogy of the Universidad Complutense de Madrid.

The specific objectives proposed for this are the following:

- To weigh the relative importance of each one of the contents of the subject.
- Determine the number of elements to be included in the test, and the number of items in each issue for each level of the taxonomy of objectives.
- Establish the correspondence contents - objectives - number of items.





3. Methodology.

The methodology is quantitative, adopting a structured approach to identify general patterns that characterize our population (Ugalde and Balbastre, 2013), since what is intended is to build an objective test that measures academic achievement of students in a compulsory course of 2nd year of the Degree of Pedagogy of the Complutense University of Madrid.

4. Objective Test Planning.

1. The first step has been carried out for the construction of the test and is to weigh the relative importance of each of the topics or contents of the subject.
2. After weighing the topics, the number of items in the test has been determined, and then distributed according to the relative importance of each topic.

Table 1

Weighted distribution of items according to the relative importance of each item.

Theme	Relative weight	Number of items	Number of items adjusted
1. Introduction to the sociology of the Educational System	10	4	4
2. Institutionalization of the Educational System	twenty	8	8
3. Agents of the Educational System	fifteen	6	6
4. The content of education	twenty	8	8
5. Family and Educational System	fifteen	6	6
6. Education, training and employment	10	4	4
7. Education and inequality	10	4	4
	$\Sigma = 100\%$	$\Sigma = 40$	$\Sigma = 40$

Source: self made.

As seen in the table, items 2 and 4 are those with a higher relative percentage (20%) importance, since the contents covered are basic for understanding how the education system functions. Topics 3 and 5 have been allocated a relative percentage of 15%, since these are very relevant but less extensive than the first group. The topics with the lowest percentage of importance (10%) are topics 1, 6 and 7. In the case of topic 1 this is because it is an introductory topic to the subject. In the case of items 6 and 7, these are brief topics in which very specific contents on the educational system are dealt with.





3. After determining the number of items assigned to each item, objectives have been established which will be measured through the items. For this, the taxonomy of objectives of Bloom has been taken as base. Once the cognitive levels to be evaluated in each subject and the number of items per subject have been determined, a number of items per cognitive level have been assigned, taking into account the characteristics of the subject as well as the expected learning by the students.

Table 2
Correspondence content-objectives-number of items assigned to each behavior to be evaluated.

Cognitive level (objectives)	Themes (content)	Total items by cognitive level
	1 2 3 4 5 6 7	
1. Knowledge	X4 X3 X4 X2 X2 X2 X4	twenty-one
2. Understanding	X1 X2 X2 X1 X1	7
3. Application	X1 X2 X1 X1	5
4. Analysis	X1 X2 X2	5
5. Synthesis	X1	1
6. Evaluation	X1	1
Number of items assigned to each theme	4 8 6 8 6 4 4	40

Source: self made.

Topics 1 and 7 only require the first cognitive level of objectives (knowledge), since what is sought is the mastery of a series of basic concepts by students.

Topic 3 will also require the next level (understanding), since it not only requires the knowledge of the different agents that make up the educational system, but also the understanding of the role played by each one of them.

Topic 6 adds the level of application, being especially important the generalization of the concepts and ideas treated in the theme.

Topic 5 incorporates the level of analysis, which is an essential requirement to understand the relationships between family and the educational system.

Topic 4 requires the 5th level of cognition (synthesis), taking specially into account the student's ability to synthesize the key concepts of the subject.

In topic 2 we find the core contents of the subject, which is why this topic will incorporate questions of the highest cognitive level (evaluation).





5. Construction of the Objective Test.

Then the objective test built on rec data in the tables above, and in general characteristics, required elements of any objective evidence exposed:

1. Social learning by teaching is based on: a) Our ability to transmit experience through language. b) Imitation by observation of the behavior of another or other individuals. c) The communication of some individuals to others of their experience in interaction with them or at a distance.
2. In the primary groups of socialization the contacts or social relations are: a) Informal, utilitarian, personal and total. b) Informal, intimate, personal and total. c) Formal, intimate, personal and total.
3. Informal education: a) It has explicit educational objectives and there is expressed pedagogical mediation. b) It is a methodical, intentional, conscious and structured education. c) It is produced in conjunction with other social processes that are educationally undifferentiated and non-specific.
4. According to John Dewey, one of the most important functions of the school would be: a) Emancipate the child from his primitive emotional identification with the family. b) Eliminate harmful environmental risks as far as possible. c) Select the students according to their performance.
5. Title IX of the Constitution of 1812 states: a) The universality of primary education. b) The universality of primary and secondary education. c) The private nature of the national education system.
6. The education system of the Second Republic: a) Suppress textbooks and eliminate the division of science and letters. (b) It establishes a specific education for women, oriented towards housework and motherhood. c) Prohibits co-education.
7. Order chronologically the following educational laws: LOCE, LOE, LOGSE, LODE, LGE, LOMCE. 1. LGE 2. LODE 3. LOGSE 4. LOCE 5. LOE 6. LOMCE.
8. To what historical period does the following image belong? Justify the answer by identifying the imagin at least three elements: Francoism: 1. Crucifix 2. Portrait of Franco 3. Portrait of Primo de Rivera.



9. In relation to the socio-economic changes of the 60's of the twentieth century, point out the true statement: a) The liberation of the economy is a consequence of the failure of the autarchic model. b) The reform of the educational system is a condition for economic development. c) a and b are correct.



10. The educational expansion that began at the beginning of the 1960s was a consequence of: a) reduction of internal and external migratory movements; b) the modification of the authoritarian political orientation of the Franco regime; c) the reactivation of the economy, the improvement of living standards, and expectations of social advancement.
11. The "economic theory of human capital" states that: a) Formal education contributes to national economic growth and investment and is a profitable enterprise for the family. b) Formal education contributes to national economic growth, but it is not a profitable family investment. c) Formal education does not contribute to national economic growth, nor is it a profitable family investment.
12. One of the most important novelties of the LOGSE was: a) the territorial redistribution of the exercise of competencies in educational matters, within the framework of the Autonomous State; b) the recognition of the participation of parents, teachers and students in the control and management of the centers supported by public funds; c) the extension of compulsory and gratuitous education until the age of 16.
13. As for the concept of youth, there are the following angles: a) youth as a social phenomenon depends mainly on age; b) the existence of youth as a defined group is a universal phenomenon; c) youth is a stage of transition from child dependency to adult autonomy.
14. Teacher-centered models or transmissive models are based on: cultural psychology and cognitive psychology; b) the method of the master class c) the consideration that the teacher must start from the centers of interest of the students.
15. Students who maintain an instrumental relationship with academic studies maintain a conception of vocational studies and hope that the university will allow them to deepen the foundations cone field they have chosen: a) True b) False.
16. College students often value teacher-centered and content-based classes positively when: a) the teacher speaks slowly to allow students to take notes; b) the contents of the subject present some difficulty; c) the explanation of the subjects is based on the exposition of theoretical concepts.
17. In ethnographic studies in the classroom, it has been observed that the best and worst students are recognized and identified first and then mediocre and intermediate. According to Parsons and Lacey, what process relates this fact? : Differentiation
18. Relate the following statement with one of the following theoretical guidelines: "The faculty is undergoing a gradual process of deskilling, a result of streamlining processes of teaching pushing him slowly to inclusion in the working class": a) functionalism; b) neomarxism; c) Weberian approach.
19. Intergenerational cultural reproduction is: a) selective and limited; b) selective and unlimited; c) indiscriminate and unlimited.
20. What are the three competencies that the Pisa Report values? a) Mathematics, Reading and Art. b) Mathematics, Reading and Science. c) Mathematics, Reading and autonomy and personal initiative.





21. The learning of obedience and control of the impulses in the classroom are part of: a) the explicit curriculum; b) the curriculum vitae; c) the hidden curriculum.
22. List the following authors with the theoretical perspective they represent:

Robert Dreeben (3)	1. Theory of correspondence
Samuel Bowles (1)	2. Theory of resistance
Michael Apple (2)	3. Functionalism
23. List the following statement with one of the three theoretical approaches to the curriculum: "Students are active and thinking agents who reinterpret the information received in the school, partially accepting what is transmitted to them and, in certain cases, completely rejecting the significant content seeking to be on them ": a) functionalism.; b) theory of correspondence; c) theory of resistance.
24. List the following statement with one of the three theoretical approaches to the curriculum: "Students, through their participation in the rituals and regularities of daily life in schools, learn workplace discipline, the legitimacy of the structure of classroom authority, and hierarchical positions and definitions of social classes": a) functionalism; b) theory of correspondence; c) theory of resistance.
25. According to Basil Bernstein, "the way in which a society selects, classifies, distributes, transmits and values knowledge for teaching reflects the distribution of power within it and the way in which it is guaranteed social control of the individual components ". With this, Bernstein states that: a) the contents of teaching will be the product of a selection, made in a more or less conscious and systematic way, of the knowledge available in culture at a given moment in the history of a society; b) school education is not limited to a selection of available cultural knowledge and materials. School transmission of selected knowledge requires a work of reconstruction and organization for didactic purposes. c) In modern societies, due to the speed of its social and cultural changes and the prodigious amount of knowledge that it produces, the phenomenon of cultural selection is more complex than in the past.
26. Functionalism and the theory of correspondence between the school and the productive capitalist world have many points in common. Both theories assume that the school: a) It transmits to the students some meanings and values that are not functional for the social system. b) It is an institution that contributes to the maintenance of society. c) It can contribute to both the social and cultural reproduction of society and its transformation.
27. Regarding family positions in relation to the educational system, in the client position: a) the axis is the unquestioned authority of the father-male over the mother-woman, and of both spouses on their descendants; b) the authority is transferred to the instances considered legitimate to regulate social life; c) the educational axis is the ethics of individual effort, the ability of the subjects to develop in a plural world and open to competition.





28. With respect to the rethinking of the school itineraries to reduce school failure, from the institutional discourse it is proposed: a) early curricular diversification adapted to the capacities and interests of each subject; b) to support the curricular diversification in force with compensatory bridge classrooms and for the new immigrant students; c) the need for a common basic level for all students and then curricular diversity.
29. Based on the characteristics of the "adaptive family", what is the cause of conflicts in this type of family? : A) children 's behavior (drug use, sexual orientation, friendships, relationships with siblings); b) adjusting roles in the new family and relationship structures; c) issues of morality, training and money.
30. Relate the following statement to one of the following family positions in relation to the educational system: "Teachers should be good professionals of their own, specialists in their specific task of teaching, such as doctors or gardeners in their respective fields. Faculty selection should be done according to criteria of quality and competence, in terms of objectives to be evaluated periodically ": a) patriarchal; b) client oriented; c) liberal.
31. What family positions pose a relationship of dependence on authority?: a) patriarchal and client oriented; b) patriarchal and liberal; c) client oriented and liberal.
32. What is the main "handicap" of familial or inbred family? : A) the children are at risk of uncritically adopting the values inculcated by their parents; b) children are at risk of adopting values and behaviors that are opposed to the dominant values of their parents; c) the family runs the risk of disengagement between parents and children, or in the couple.
33. What is the Economically Active Population? : A) set of people not employed nor actively sought in the reference week of the survey; b) set of people who have an occupation or, without having it, during the week of the survey has sought work and was in a position to do so; c) set of people who have an occupation.
34. Qualitative misalignments between Higher Education and employment refer to: a) unemployment or underemployment of the graduates; b) inadequate distribution of university students among the different fields of study; c) inadequate contents of the races with a view towards professional exercise.
35. The specialization of the degrees with the reform of "Bologna": a) it can be difficult to obtain a first job; b) it improves the possibilities of adaptation of the graduates to the real demands of employment; c) it is a consequence of the evolution of the labor prospects of future graduates.
36. For years, Japan has opted for "theoretical and non-specialized training that forms an intelligent and adaptable workforce." Relate this sentence with one of the following terms: a) professionalization; b) deprofessionalization; c) over-education.
37. According to the PISA 2003 Report: a) the socioeconomic origin of the student has a positive and statistically significant effect in all countries, determining their ultimate academic performance; b) the socio-economic origin of the student has a positive and statistically significant effect in all countries, but does not determine their ultimate academic performance; c) there is no correlation between the socioeconomic origin of the student and his or her academic performance.





38. What three elements include Blau and Duncan to determine an individual's socioeconomic status?: a) the social origin of the individual, his education and his social position of destination; b) the education of the father, his education and his social position of destiny.; c) the occupation of the father, his education and his social position of destiny.
39. Point to the true statement: a) the levels of educational mobility have increased for the younger population groups; b); levels of educational mobility have diminished for younger population groups. c) we can not determine whether the levels of educational mobility have increased or decreased for the younger population groups, since the latter have seen an increase in their average educational level.
40. According to Becker (1981): a) divorce overloads mothers, negatively affecting their well-being, leading to inconsistent parenting and poor supervision of children; b) a single-parent household is not able to generate sufficient resources to maintain the volume of services and activities of a traditional nuclear household; c) the absence of one of the parents in the home can harm the welfare of the children, by depriving them of economic resources, a paternal reference model, and emotional attention.

6. Conclusions.

To validate this measurement instrument, the reliability and validity coefficients were calculated using the SPSS program.

The reliability of the test relates to the accuracy and precision of the test. It is measured by the coefficient of reliability (r_{xx}). This coefficient always varies between 0 and 1, being the more reliable the test the closer it approaches 1. In this sense, it is estimated that the coefficient of reliability will be satisfactory whenever it is higher than 0.8 (García Ramos, 2012). The relative reliability procedure is used to estimate the reliability coefficient. This procedure can be performed in three ways: as stability (application of the same test on two successive occasions: correlation coefficient between the two series of scores), as equivalence (application of two parallel forms of a measuring instrument: correlation coefficient between the scores in the two parallel forms) and as internal consistency (the test is applied only once). In the case of our test, we estimated reliability as internal consistency using the procedures of the Spearman-Brown and Guttman and Cronbach Alpha moieties. The coefficient of reliability (r_{xx}) is 0.87 by the procedure of the two halves and 0.83 by the procedure of Cronbach's Alpha, so we can conclude that the reliability of the test is satisfactory.

The validity of a test refers to the degree to which the test measures the intended trait. It is measured by the coefficient of validity (r_{xy}). This coefficient always varies between 0 and 1, being more valid the test the closer it approaches 1. In this sense, it is estimated that the coefficient of validity will be satisfactory whenever it is higher than 0.5 (García Ramos, 2012). In order to estimate the validity coefficient, the correlation between the scores in the test and the criterion is performed. In this case, the validity coefficient is 0.86, so the validity coefficient is satisfactory.





Once it was concluded that the test accurately measured the performance of the students of the Degree in Pedagogy in the subject Sociology of the Educational System, the difficulty, homogeneity, and validity indexes of each item were calculated. In this sense, it was decided to eliminate items 4, 6, 11, 20 and 37, since they had unsatisfactory homogeneity and validity indexes. Also, in order to balance the difficulty of the test, it must not be too difficult in and of itself; there should be 2 difficult, and 4 easy items should be eliminated; and add 7 of medium difficulty and 1 very easy.

Finally, regarding the classification, in order to facilitate comparison of scores, the scales of the raw scores of the subjects in percentiles, Z_e , S and P_n were established.

The limitations of this work primarily derived from the sample used for the study so that as future research, the construction of other similar tests for other courses and degree courses of Pedagogy is suggested, and contrast the results of students with other measurements on the self - efficacy of teachers themselves, for their close relationship with the academic performance of students. In this regard, some studies like Martínez, Hervás and Roman (2017), emphasize the importance of knowing the beliefs and values of university teachers on their own effectiveness for quality teaching.

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