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Confidence-Based Learning in Investment Analysis

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Abstract. The aim of this study is to determine the effectiveness of using multiple choice tests in subjects related to the administration and business management. To this end we used a multiple-choice test with specific questions to verify the extent of knowledge gained and the confidence and trust in the answers. The tests were performed in a group of 200 students at the bachelor's degree in Business Administration and Management. The analysis made have been implemented in one subject of the scope of investment analysis and measured the level of knowledge gained and the degree of trust and security in the responses at two different times of the course. The measurements have been taken into account different levels of difficulty in the questions asked and the time spent by students to complete the test. The results confirm that students are generally able to obtain more knowledge along the way and get increases in the degree of trust and confidence in the answers. It is confirmed as the difficulty level of the questions set a priori by the heads of the subjects are related to levels of security and confidence in the answers. It is estimated that the improvement in the skills learned is viewed favourably by businesses and are especially important for job placement of students.

Keywords: Knowledge, test, trust, confidence, skills, administration and business management, investment analysis

1 Introduction

The number of students attending higher education institutions has more than doubled in Europe during the last twenty-five years. The resulting flow of graduates on the labour market may justify the doubts expressed about these young people's career prospects, given the present economic and social trends [4]. One of the central issues in higher learning today is the certification of knowledge by universities. In addition to the core mission of knowledge production and transmission, the University must respond to changing education and training needs occasioned by the knowledge economy and society, among which are: increased scientific and technical education, and the need for cross-curricular competencies and lifelong learning opportunities [8].

This paper aims to deepen the study of the concept and measurement of knowledge, especially in this type of knowledge that is acquired in order to get more training. This training usually takes place by definition in professional training schools.

Technical or professional knowledge is acquired through different means and is not an objective of this study to determine the sources through which knowledge can be transmitted to facilitate learning. The aim of this work is to test a system to assess the specific knowledge to be transmitted to achieve a minimum requirement, while at the same time introduce a system of quality assessment, based on the concept of confidence of knowledge. In this sense, test an evaluation system to determine the degree of utilization of a subject related to investment analysis in accordance with the two parameters mentioned, ie. the level of knowledge gained in a particular field and the level expressed confidence about the answers.

It is important to note that despite the efforts made so far, has not yet been possible to find a comprehensive and effective system that allows students to assess themselves at the beginning and end of a training process so that measurable manner can be shown the progress achieved in each of the aspects evaluated. This could be one of the possible outcomes of this project as well its contrasting by the faculty at the university level.

Definition and assessment of knowledge

We start from the classical definition of knowledge as justified true belief. Usually talking about a real and true answer is difficult and complex. so it has replaced the concept of true by "right" somehow to suggest that such knowledge is recognized among the group that is grouped so it is ready to establishing rules on a particular subject area.

Usually experienced teachers are able to recognize when a student masters the subject, if studied as agreed, or if they can adequately reflect on the concepts seen in

class, the degree of understanding of different readings, the use of vocabulary appropriate specialist, and so on. All these perceptions, together with the tone of voice used, the degree of security in the responses gives the teacher sufficient evidence on the level of knowledge a student possesses.

The term professional is used here according with *the International Standard classification of occupations (ISCO)*: "Professionals increase the existing stock of knowledge, apply scientific or artistic concepts and theories, teach about the foregoing in a systematic manner, or engage in any combination of these three activities" [6].

Regarding to Finance and Administration, Department managers plan, direct and coordinate the internal administration or financial operations of the enterprise or organization, under the broad guidance of the directors and chief executives, and in consultation with managers of other departments or sections.

The knowledge we have a phenomenal challenge as is to establish the rules by which we must reward certain kinds of knowledge and penalize others, taking into account the two parameters previously expressed: the level of knowledge through its approximation to the correct answer and the confidence level showed.

To be useful to a person, the knowledge must not only be acquired, but also retained or remembered [5]. In professional life there are many occasions when it is necessary to demonstrate not only that they have some knowledge but it is necessary to implement them, share them with others, colleagues, subordinates, bosses, etc. ... Elements as interaction, cooperation, credibility, confidence and commitment are recognized in the literature as elements that strengthen the relationship between the organization and consumers, making them more stable with time [9]. In all these cases the degree of assurance on the statements and responses manifested as one of the attributes most valued by managers and professionals affiliated companies.

In today's multiple-choice tests if an incorrect answer is selected, then it is interpreted simply to mean that the person does not know the answer, i.e. is uninformed. This inference is misleading. Specifically, the person may be extremely sure that the incorrect answer which he/she selected is correct and, thus, may be misinformed—which is much worse than being uninformed [5].

The aim of this work focuses on linking the assessment of learning outcomes from a mixed perspective. Making use of a multiple choice questionnaire will assess the degree of acquired expertise combined with the confidence placed by people who answer the questionnaire. Confidence-based learning has been used extensively in some specific knowledge areas as for example Gardner-Medwin and Gahan [3], but as we know it hasn't been studied in areas related with financial concepts.

2 Research Design

In general, we distinguish between two types of tests: tests training (formative assessment) and evaluative tests (summative assessment). Regarding summative

assessment, Confidence-based marking places a premium on careful thinking and on checks that can help tie together different facets of knowledge. Thereby, it encourages deeper understanding and learning [1].

However, in this article and following the work of Gardner-Medwin, A. [2] [3] from the standpoint of learning the evidence seems most effective when they are voluntary and have no impact in terms of academic note, so it is filled in completely voluntary (formative assessment) on the part of students and the commitment by part of the academic direction of not being used to impose a different note, and that the only purpose was purely scientific.

The final version of the test contains 20 questions with response alternatives where one and only one was correct. While it is possible that the correct answer would be: "above all" or "none of the above" In addition and with each of the questions the student should answer the degree of confidence in the response. The questions were contained in four blocks of homogeneous content. Each block contained five questions, two of which corresponded to level 1 (basic), two questions corresponded to level 2 (intermediate level) and one question to level 3 (advanced).

In total, therefore, the breakdown by level of difficulty of the 20 questions was: 8 questions of level 1, 8, and Level 2 questions 4 questions at level 3.

The questionnaires are linked to the knowledge area of investment analysis, which is part of the curriculum of the Administration and Management degree.

The student profile in this qualification standard is a working person, over the age of 30 years and with family responsibilities. Were not taken into account in the study variables of gender, although studies such as Koivula et al. [7] found differences in the responses by gender. In this study we considered the processing of data in aggregate form.

The test was designed to evaluate the work done during the whole course. An important aspect of the questionnaire is that it was distributed in two different time moments: at the beginning and at the end of the course. The first questionnaire was completed before performing any academic activity. The second questionnaire, which contained exactly the same questions, was completed at the end of the year coinciding with the usual period of examinations. There was zero feedback on the outcome of both questionnaires, and there weren't any comments on the contents of the questions and the possible score of the exercises performed.

Open University of Catalonia is a virtual university so we decided to distribute the test through electronic form, which assured the absence of errors in transcribing data. At the same time, automatic annotations were included on the time spent by each student on completing the assigned test. We believe that the use of electronic test can be an advantage for its realization. Also corresponds to the daily and habitual use of technology in organizations. With the widespread use of ITs, global or virtual teams have become a reality. Some authors, analyzing the ability and willingness to cooperate, suggest that ITs increase teamwork integration in two ways, firstly

facilitating and speeding knowledge transfer, both tacit and explicit and secondly, reinforcing the levels of trust and confidence that normally develop in face to face meetings [9].

The objectives of the research proposed and discussed in the following paragraph are:

1. Is there a difference in the degree of confidence in the responses in the two periods?
2. Does it match the degree of difficulty of the questions provided by teachers with lower levels of confidence in the answers?
3. Is it related to the time spent fulfilling in the test with the level of confidence in the answers?

From a total of 606 students, 101 respondents filled out the first questionnaire, and 67 students filled the second. Producing a response rate of 16,7 % and 11 % respectively.

3 Data and Analysis

As stated earlier, each question in the questionnaire included another question about the degree of security and confidence in the response variable using a Likert-type scale, with five values, on which the value 1 indicated “Extremely unsure”, 2: “Very unsure”, 3: “Somewhat sure”, 4: “Sure”, and 5: “Extremely sure”.

To verify the above proposals has proceeded to a data analysis using the t test for equality of means.

Analysis of the degree of confidence in the answers in the two periods

The following table shows the main descriptive statistics of the analysis.

Table 1. Mean, standard deviation and T-test results of the degree of confidence in the answers

	Period	N	Mean	Std. Deviation	t-value	p-value
Confidence	Per. 1	101	36,0891	15,26637		
	Per. 2	67	66,4925	13,36365		
T-test					-13,271	0,000 < ,05

The security expressed in the responses of period 1 equals 2,94, being the period 2 of 3,63. Furthermore, this difference shows up as significant. Increased confidence in the response between the two periods is 23, 47%. This increase is explained by the normal monitoring of the course by students.

Analysis of levels of difficulty

This section analyzes the responses according to the level of difficulty a priori established by the faculty. The results show that the difficulty of the questions selected by the teacher adapts to the difficulty level set. The higher the difficulty the greater the uncertainty expected in the response. Furthermore, decreases by security levels. The security level used corresponds to the average of each level.

Table 2. Mean and standard deviation of confidence between levels

Confidence	Period	N	Mean	Std. Deviation	Minimum	Maximum
Level 1	Per. 1	101	2,0532	,86482	,25	4,25
	Per. 2	67	3,5243	,72111	1,88	5,00
	Total	168	2,6399	1,08411	,25	5,00
Level 2	Per.1	101	1,8119	,78235	,38	3,75
	Per.2	67	3,2351	,73711	1,75	4,75
	Total	168	2,3795	1,03430	,38	4,75
Level 3	Per.1	101	1,2921	,88746	,00	4,00
	Per.2	67	3,1045	,86509	,00	5,00
	Total	168	2,0149	1,24886	,00	5,00

The ANOVA analysis performed shows significant differences between the averages of the three levels.

Table 3. Anova test of confidence between levels

		Sum of Squares	df	Mean Square	F	Sig.
Level 1	Between Groups	87,163	1	87,163	132,608	,000<0,05
	Within Groups	109,112	166	,657		
	Total	196,275	167			
Level 2	Between Groups	81,586	1	81,586	139,525	,000<0,05

	Within Groups	97,067	166	,585		
	Total	178,653	167			
Level 3	Between Groups	132,310	1	132,310	171,386	,000
	Within Groups	128,152	166	,772		
	Total	260,463	167			

Analysis of the time differences between the two periods

Under the assumption that all the time spent has been devoted to reflection, the time dedicated to the second period, when the course was ended is higher than in the first period (16 minutes 49 seconds against 16 minutes 4 seconds). However, the differences between time periods are shown as not significant at the 0.05 confidence level.

Table 4. Mean, standard deviation and T-test results of time differences

	Period	N	Mean	Std. Deviation	t-value	p-value
Time (seconds)	Per. 1	101	964,7228	506,56329		
	Per. 2	67	1099,0597	586,07875		
T-test					-1,580	P=0,116>0,05

4 Summary and Conclusions

In this paper we have tried to verify changes in the degree of confidence in the response of a group of students at the Bachelor's degree in Business Administration and Management of the UOC. It has highlighted the importance of evaluate adequately the knowledge gained by students and the need to provide this knowledge-based guidelines on confidence and trust, and most cherished values the company at present.

On this basis, we have designed a questionnaire with 20 questions and 4 possible answers, the student respondents who voluntarily participated in the work, applied to the area of investment analysis. These results allow us to state that the degree of confidence in the response increases dramatically at the end of the period (from 1,8 to 3,33, representing an increase of 85%). Since this, difference clearly significant. In terms of confidence level used (a variable Likert 5 positions) the value would be

located near 1,8 to a value less than "Very unsure" as that 3,3 would be located in "Somewhat sure".

In a second step, we proceeded to analyze the three different levels of difficulty of the questions. From the data, we can say that the greater the difficulty a priori established by teachers, the lower the level of confidence achieved. At level 1 (basic), confidence average goes from 2 to 3,5 (an increase of 75%), at level 2 (intermediate), the average goes from 1,8 to 3,2 (increase of 50 %), whereas at level 3 (advanced), the average goes from 1,3 to 3,1 (one 138.5% increase). The use of difficulty levels shows that the perception of teachers is consistent with the results, and also presents a potential for the development of new educational elements based on the degree of difficulty of the subjects studied.

Finally, we proceeded to analyze the time spent thinking to complete the questionnaire, by analysis of means. The result shows that it has been used a little more time to answer the second questionnaire than the first, although the difference is not significant from a statistical standpoint. We believe that the difference is due to the accumulated knowledge stock owned by the student at the end of the course, and the need for reflection that should be evaluated before making decisions.

We consider that the approach used is interesting and with high value in the area of management and business administration. Different variants may arise in the future as the tool evolves and its use for academic assessment.

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