

STUDENT LEARNING MOTIVATIONS IN THE FIELD OF MANAGEMENT WITH (AND WITHOUT) GAMIFICATION

MOTIVACIONES DE APRENDIZAJE DE LOS ESTUDIANTES EN EL ÁMBITO DE LA GESTIÓN CON (Y SIN) GAMIFICACIÓN

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ABSTRACT

This study applied the Academic Motivation Scale (AMS) by Vallerand et al. (1992), adapted for the Accounting and Marketing Academic Motivation Scale (AMAMS) in order to analyse who is the motivation level of Portuguese

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undergraduate students who were attending the Curricular Units (CUs) of Accounting and Marketing, in the beginning, and in the end of 2017/2018 academic year. This longitudinal empirical study reports motivation evolution level of students who studied Accounting and Marketing knowledge areas at two different temporal moments, with and without gamified teaching resource, during the classes. The final goal of this study is to analyse the motivation evolution with and without application of the gamified resources in the teaching process. The study included a total sample of 1923 students divided into two groups: the Gamified Group (GG) and the Control Group (CG) and with their motivations subject to evaluation prior to the beginning of classes (Moment 1 – M1) and at the end of the scheduled classes (Moment 2 – M2). The results enable the verification that the GG students experienced an increase in their Motivation to Learn (IMTK) between M1 and M2 greater than the CG students.

KEYWORDS

motivation, gamification, accounting, marketing, students

RESUMEN

Este estudio aplicó la Escala de Motivación Académica (AMS) de Vallerand et al. (1992), adaptado para la Escala de Motivación Académica de Contabilidad y Marketing (AMAMS) con el fin de analizar cuál es el nivel de motivación de los estudiantes de pregrado portugueses que asistían a las Unidades Curriculares (CU) de Contabilidad y Marketing, a comienzos y a finales del año académico 2017/2018. Este estudio empírico longitudinal muestra el nivel de evolución de la motivación de los estudiantes que estudiaron áreas de conocimiento de contabilidad y marketing en dos momentos temporales diferentes, con y sin recurso de enseñanza gamificado. El objetivo final de este estudio es analizar la evolución de la motivación con y sin la aplicación de los recursos gamificados en el proceso de enseñanza. El estudio incluyó una muestra total de 1923 estudiantes divididos en dos grupos: el Grupo Gamified (GG) y el Grupo de Control (CG) con sus motivaciones sujetas a evaluación antes del comienzo de las clases (Momento 1 - M1) y al final de las clases programadas (Momento 2 - M2). Los resultados permiten verificar que los estudiantes de GG experimentaron un aumento en su Motivación para Aprender (IMTK) entre M1 y M2 mayor que los estudiantes de CG.

PALABRAS CLAVE

motivación, gamificación, contabilidad, marketing, estudiantes

INTRODUCTION

Academic performance is crucial to students, who represent the key actors in the teaching process, and closely interrelates with two completely antagonistic psychological feelings, on the one hand, motivation and, on the other hand, demotivation (Yen, Tuan, & Liao, 2011). Correspondingly, higher education institutions (HEIs hereafter), out of concern over such phenomena, need to evaluate the levels of motivation of their students in the diverse contexts that they

go through and across the most varied fields of knowledge (Diviani & Meppelink, 2017). The various types of motivation span the intrinsic and extrinsic dimensions or even amotivation/demotivation with the respective indicators fundamental to evaluating the teaching-learning process so as to be able to undertake the methodological changes that, at each moment, enable improvements to areas that reveal the scope for carrying out positive changes. To this end, we need to understand the motivational processes interrelated with teaching in general and students in particular so as to identify and catalogue problems and open up the paths to achieving qualitatively better academic performances.

One of the main theories deployed in the analysis and measurement of the complex motivation construct is Self Determination Theory (SDT) put forward by Ryan & Deci (2000), who present a robust theoretical framework inherent to this important theme as it interrelates motivation with individual behaviours and attempting to explain the why behind these behaviours as well as the consequences of their results.

Diverse studies (Alivernini & Lucidi, 2011; Huett, Kalinowski, Moller, & Huett, 2008; Taylor et al., 2014; Tinto, 2006) approach the motivation of university students through the application of a range of different measurement scales even while there is general acceptance of one of the leading psychometric scales able to measure to a high level of accuracy the various types of motivation, that is, the Academic Motivation Scale (AMS) set out by Vallerand et al. (1992), which applies various constructs that derive from the SDT theoretical framework. This scale has also undergone utilisation and validation by various different authors (Barkoukis, Tsorbatzoudis, Grouios, & Sideridis, 2008; Buckley & Doyle, 2016; Guay, Morin, Litalien, Valois, & Vallerand, 2015; Joly & Prates, 2011; Lim & Chapman, 2015; Smith, Davy, & Rosenberg, 2010; Spittle, Jackson, & Casey, 2009; Stover, de la Iglesia, Boubeta, & Liporace, 2012; Tóth-Király et al., 2017; Vecchione, Alessandri, & Marsicano, 2014) in various countries and educational contexts, especially higher education, demonstrating its efficiency in grasping the different types of motivation experienced by students within their academic environment.

Hence, following the validation of the AMS to the Curricular Unit (CU) teaching contexts in the field of Management through its adaptation to the AMAMS, we sought to attain the following objectives through this research project: (1) Analyse the state of motivation at the beginning of the school year (M1); (2) Apply a gamified teaching resource during the classes; (3) Analyse the motivation evolution after the application of the gamified resources in the teaching process (M2); (4) Measure the motivation evolution with and without application of the gamified resources in the teaching process.

The level of information returned by this study may assist education researchers understand just why these distinctive fields of management are so truly challenging to some students and, in some cases, only attaining very low levels of academic results. Obtaining robust information on the motivations of students also enables teaching staff to take informed decisions on the strategies for deployment so as to involve students in learning processes for these fields of knowledge. Following this introduction, the article proceeds to a review of the literature, then the methodology used is defined, and the results obtained are presented and discussed. Finally, the main conclusions, contributions, limitations and future lines of research are presented.

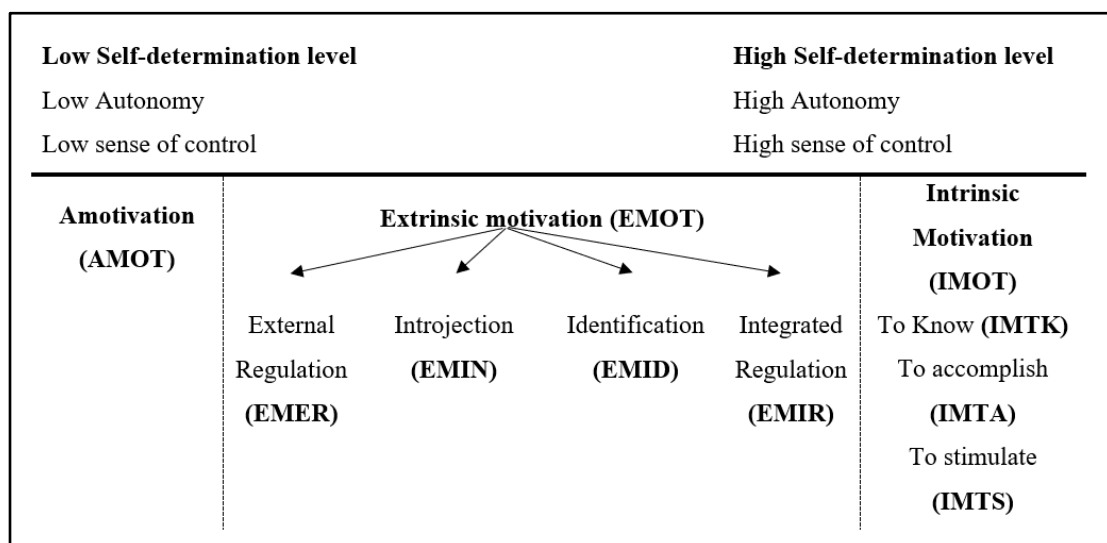
LITERATURE REVIEW

Self Determination Theory and motivation constructs

The SDT of Ryan & Deci (2000) features three core dimensions entitled Amotivation (AMOT), Intrinsic Motivation (IMOT), Extrinsic Motivation (EMOT). The AMOT dimension does not contain any subdivisions and only the variables that establish the individual dimension/construct. In turn, the IMOT dimension subdivides into the Intrinsic Motivation to Know (IMTK), Intrinsic Motivation to Accomplish (IMTA) and Intrinsic Motivation to Stimulate (IMTS) constructs. Furthermore, EMOT subdivides into the Extrinsic Motivation External Regulation (EMER), Extrinsic Motivation Introjection (EMIN), Extrinsic Motivation Identification (EMID), and Extrinsic Motivation Integrated Regulation (EMIR) constructs. However, as regards the EMOT dimension, AMS does not measure EMIR, as also stated by SDT, as this only occurs among older students who, according to the scale's authors, have already developed a greater awareness about their identity and leading to any measurement of them in conjunction with their younger peers likely to introduce bias into the results (Wang, Hagger, & Liu, 2009). The internal and external motivations of individuals represent different ways of feeling motivated over assuming certain behavioural aspects in accordance with the undertaking of the tasks set for achievement (Deci & Ryan, 2008). In this sense, whenever utilising SDT to evaluate academic motivation, we are able to perceive whether the motivation of students are more autonomous or controlled as well as verifying the type of relevance and persistence that students employ in the teaching-learning process and the weighting motivation holds in their experiences (Su, 2016; Yen et al., 2011).

Figure 1 shows SDT's different types of motivation or regulation that range from the highest to the lowest level of self-determination, autonomy and feeling of control; in other words, from amotivation to total motivation (Ryan & Deci, 2000b).

Figure 1. Self-determination continuum



Adapted from: Ryan & Deci (2000b)

The AMS uses only seven of the eight subscales of Ryan's & Deci's (2000b) Self-determination continuum, measuring three types of motivation in a self-determination growing scale that begins with Amotivation (AMOT), moves on to Extrinsic Motivation (EMOT) and ends with Intrinsic Motivation (IMOT) (Vallerand, Blais, Brière, & Pelletier, 1989; Vallerand et al., 1992). It should be noted that, within EMOT, AMS does not measure EMIR, which is also referred to in SDT, because it involves only older students, who, according to the authors, have developed a higher awareness of their own identity; therefore, when measured together with younger students, that can lead to biased results (Wang et al., 2009).

Amotivation

The AMOT concept interrelates with the demotivation of individuals that implies an absence of any perception of connections between their actions and their respective results or outcomes seemingly characterised by the lack of intentionality or the lack of either the intrinsic or the extrinsic motivation of an individual who may feel truly incapable of carrying out a particular procedure by their own will (Ryan & Deci, 2000b; Vallerand & Blssonnette, 1992). A demotivated individual enters into a state of incompetence as regards undertaking a certain specific activity, not believing that they shall be able to successfully complete it (Deci & Ryan, 2008). Because of that we formulate *H1: Amotivation (AMOT) has a negative effect on Intrinsic Motivation to Know (IMTK)*, to show that this dimension will be a negative direct impact in students motivation to know, to study and to understanding the curricular units contents (Deci & Ryan, 2008).

Intrinsic Motivation

IMOT approaches diverse types of motivation but generally relates to the pleasure and satisfaction deriving from the activities of learning, exploring or understanding a specific subject (IMTK), to enable the experiencing of a certain stimulant resulting from attaining something that stimulates and enables sensations of great pleasure (IMTS) (Ryan & Deci, 2000a; Vallerand & Blssonnette, 1992), based in this literature we propose *H2: Intrinsic Motivation to Stimulate (IMTS) has a positive effect on (IMTK)*. In other side, we formulate *H3: Intrinsic Motivation to Accomplish (IMTA) has a positive effect on (IMTK)*, because the motivation for engaging in specific tasks and the respective satisfaction arising from this achievement or the creation of something deemed important to the person (IMTA) (Deci & Ryan, 2008).

Extrinsic Motivation

EMOT results from the external stimulations, from something that gets done because the individual feels pressured to do so, or somebody convinces them to do so in order to obtain a specific reward for their efforts (EMER). We propose *H4: Extrinsic Motivation External Regulation (EMER) has a positive effect on (IMTK)*, because the state of literature says that external stimulations have impact in motivation to Know (Vallerand & Blssonnette, 1992). In this line of thinking, whenever verifying that the individual acts more out of these external pressures than their own obligation to achieve something, we encounter a literature support

to propose *H5: Extrinsic Motivation Introjection (EMIN) has a positive effect on (IMTK)*. Furthermore, according the literature we propose *H6: Extrinsic Motivation Identification (EMID) has a positive effect on (IMTK)*, because whenever individuals value the activity that they are about to undertake, consider it important, have some decision making autonomy over this act and voluntarily accept the task, we are in the presence of EMID (Deci, Koestner, & Ryan, 2001; Vallerand et al., 1992).

Motivation with and without gamification

In the teaching-learning process, motivation is determinant and applied to clearly explain the attention and efforts spent by students on their learning activities (Brophy, 1983; Brophy, 2013). Thus, every resource susceptible to deployment that enables lecturers to manage the motivation of their students, whenever possible raising this within the objective of achieving positive results and better performance standards, represents a fundamental facet to the qualitative development that is inherent to learning (Buckley & Doyle, 2014).

To obtain these objectives, there is a need to plan for motivation and its respective activation and thus implying setting targets in keeping with the types of task proposed as well as attempting to stimulate a set of motivational beliefs, such as those around self-esteem, personal interest in the tariffs proposed and also belief in the importance of the respective tasks (Pintrich, 2000, 2003). This psychological motivational process stems from the interior of the subject driven to undertake a particular action, the means of accessing and engaging with that proposed for the individual whenever perceiving in these tasks gains susceptible to driving their actions and overcoming the challenges inherent to the proposed actions (Boekaerts, 2002; Hallam, 2009).

Student motivation constitutes an important challenge as this incorporates direct implications for the quality of student involvement in the teaching and learning process (Frith, 1997). Motivated students search for new knowledge and opportunities, displaying their involvement in the learning process, enthusiastically participating in tasks and with the will to engage in continuous learning (Stipek, 2002). Student motivation provides a relevant variable for the teaching-learning process to the extent that academic results are not only explainable according to concepts such as intelligence, family context and socioeconomic status (Włodkowski & Ginsberg, 2017). In fact, through motivation, we are able to ensure students find reasons to learn, to improve and to discover and apply skills and competences essential to academic performance and the total appropriation of requirements within the learning environment (Colquitt & Simmering, 1998).

However, this approaches motivation for learning as necessary for taking into consideration within its respective range of assimilated contextual characteristics (Meece, 1991). Generically, the tasks and activities experienced in the academic environment interlink with cognitive processes, especially the capacity for attention, for concentration, for the processing of information, rationalising and resolving problems.

Due to these characteristics, some authors (Brophy, 1983; Pintrich & De Groot, 1990; Schunk, 1991) refer to how deploying general concepts about human motivation to the academic environment is not particularly appropriate without duly considering the specific features of such environments. In fact, the motivational question perhaps clarifies the reason why some students enjoy and

take advantage of academic life, display appropriate attitudes, consequently achieve new capacities and high levels of development of their respective potentials (Garrido, 1990) while others, however, demonstrate a lack of interest in the activities, very often doing them only out of obligations or with a general lack of responsibility and, in some cases, spurning a large part of academic life (Falout, Elwood, & Hood, 2009). Hence, we may state that the motivational dimension does not impact on all students in the same way and thus the need to understand why and seek out alternatives based on new strategies able to combat the rising demotivation towards academic life (Harlen & Deakin-Crick, 2010).

It is within this context of a need for new teaching strategies that gamification may play a leading role in fostering the motivation of students for learning in different ways and other types of tool that serve to complement learning (Faiella & Ricciardi, 2015; Hamari & Koivisto, 2013). These gamified resources, in the form of serious games, may represent tools that lecturers are able to deploy in the teaching-learning process given that they contribute to and enrich the intellectual and social development of students (Boyle et al., 2016; Kafai & Burke, 2015; Rashid & Asghar, 2016). Well designed and implemented games may be included and perceived as added value as well as representing an alternative teaching strategy able to achieve objectives, within the classroom context, which may range from simply playing for the sake of playing through to the construction of real knowledge (Manero, Torrente, Serrano, Martínez-Ortiz, & Fernández-Manjón, 2015), however, these resources are not applicable as a single didactic strategy as they do not guarantee the appropriation of all the expected knowledge (Hamari et al., 2016). In reality, such games provide a high level strategic teaching resource for educators and a rich instrument for stimulating the search for new knowledge in the classroom and bringing about increased levels of interest and development in any curricular unit (Qian & Clark, 2016).

Through games, students may, in accordance with their lecturers, approach diverse program contents interrelated with various areas, including: mathematics, Portuguese, the social sciences, biology, psychology, among many others (Boyle et al., 2014; Vogel et al., 2006; Wu et al., 2012). Well-designed gamified resources are able to support active learning (Gee, 2007; Squire, 2011), encourage social interactions, motivation and involvement (Csikszentmihalyi, 1990).

Nevertheless, the conception and design of games for specific educational purposes represents an interdisciplinary challenge given this requires a deep understanding of game design theory, knowledge about the respective academic field of the game as well as interlinked learning theories (Boyle et al., 2014; Landers, 2014). What is important here includes not only successfully designing the game in the expectation of students finding themselves motivated to play and acquire knowledge but also achieving this while incorporating the learning theories that underpin the teaching ongoing (Young, 2012).

METHODOLOGY

We carried out a quantitative type study, gathering the data through a questionnaire survey that applied the AMAMS scale following its testing and validation by the authors of this study. We deployed SPSS 24 software for processing the data in keeping with diverse statistical techniques such as Multiple

Linear Regression (MLR), which enabled the testing of diverse models in accordance with the aforementioned research objectives (Hair, Black, Babin, Anderson, & Tatham, 2010; João Marôco, 2010). The application of MLR provides estimates of the value of the dependent variable Intrinsic Motivation to Know (IMTK) in accordance with the independent variables EMER, EMIN, EMID, IMTA, IMTS and AMOT. The objective is thus to report the best possible and most statistically significant relationship between the aforementioned variables in order to calculate the model that best explains the motivations prevailing across diverse study groups. In order to evaluate the model, we applied quality of adjustment measurements, such as Pearson's R correlation coefficient, the determination coefficients R^2 , R^2 adjusted, Variance Inflation Factor (VIF) and the Durbin-Watson test (J. Marôco, 2014; Pestana & Gageiro, 2014).

Translation and adaptation of AMS to AMAMS

We translated and adapted AMS to AMAMS with the purpose of testing the motivation of a diverse range of Portuguese HEI students who, in the 2017/2018 academic year, attended the Accounting CU and the Marketing CU for the first time. Hence, the lead question in the original AMS "Why do you go to college?" underwent translation and adaptation to "Why do you spend time studying accounting/marketing?" We then translated and tailored the 28 items making up the scale in order to be applicable to students engaging in the Accounting and Marketing learning contexts (Table 1). The adaptation of this scale did not involve many changes and enabling the application of the same scale to both CUs through including the same affirmations and only switching between the respective CU names. We furthermore retained the 7 points Likert type scale of the original AMS, which varies from "Totally does not correspond" to "Totally corresponds" and as well as all of the variables belonging to AMOT, EMOT and IMOT.

Application of the AMAMS to Portuguese HEIs

We applied the AMAMS questionnaire in both paper and online formats with Accounting and Marketing students at different Portuguese HEIs voluntarily participating in the study. Students answered the questionnaire during the class through coordination with the lecturers responsible at the participant HEIs during the first and second semesters of class in the 2017/2018 academic year. As some first year HEI students only study these CUs in the second semester, the data collection process still spanned a complete one academic year duration.

Students answered the initial questionnaire (M1) in the second or third week of classes and once again in the final week of classes (M2), thus, prior to the examination period. Students received around 30 minutes both to respond to the 28 items in the questionnaire and to provide their sociodemographic details.

Participants and procedures

The respondents were all students with their ages ranging between 17 and 48, with an average age of 20.16, with 42% of participants male and 58% females. We collected a total of 1.923 completed questionnaires (1.011 of Gamified Group and 912 of Control Group) from a total population of 3.083 accounting students and 484 marketing students, with 74 excluded due to incorrect completion, whether failing to respond to one or more questions or providing more than one answer to an item. Some 20 HEIs participated out of an overall total of 24 such

institutions and thus corresponding to 83.33% of state HEIs with a total response rate of 53.91% (Table 2). In total, we had 1,616 valid questionnaires for accounting and 307 for marketing to reach an overall total of 1,923.

Resources

Two learning games for different fields of Management (Accounting and Marketing) were built and used online, having been applied to students in Portuguese Higher Education Institution (HEI) during the academic year of 2017/2018. The game Accountinggame was applied to first-year students in Economics and Management degrees, and the game Marketinggame was applied to first-year students in Marketing degrees. Both games consist of a quiz in which the students have to answer questions relating to the programme content that they are learning within the Accounting and Marketing CUs.

The contents of the games were created based on the programmes taught in different Portuguese HEI using contents that were common to all participant HEI. In order to use this resource, students had to register in the respective platforms (www.jogosdegestao.pt), fill out sociodemographic data and, from then on, they were able to play individually or in network.

The games have a general ranking which shows the students with higher scores resulting from the correct answers given throughout the games they have taken part on. This score accumulated from game to game and was national-wide. The students had immediate feedback on their score and performance throughout the game, and it was always possible to visualize the correct answer, even when the student did not get it right. Such information was also available in relation to other students who were playing the same game (Hamari & Eranti, 2011). The possibility of playing as a group, creating a profile, and having access to the answers of other users allowed for an interaction close to that of a social network (Baker & White, 2010; Lin & Lu, 2011).

The average of game usage in-class was three two-hour sessions each; however, usage was superior in 87,2% of the students given that they could access this resource autonomously outside class hours.

The study was conducted in all HEI which accepted to participate, and two groups of students were created: the Gamified Group (GG) and the Control Group (GC). The GG was made up of students who used the game as a complementary learning tool, whereas the GC was made up of students who did not have access to the game.

Throughout the first six weeks of classes in the semester, students registered in the game and did not have access to its contents, attending classes with the respective teachers. From the seventh week on, the contents of both games were made available so that the teacher could use them in class context as a complement to teaching the subject.

The students had the possibility to use the games autonomously any time they wished to, as a way to test learning achieved in class context. The use was monitored throughout the semester, checking the time of use for each student, the contents studied, the rate of right and wrong answers, the number of times they completed the game, how many questions they answered, how many questions they got right and wrong, among other information relating to the use of the games in different topics of knowledge.

Research model and hypothesis proposed

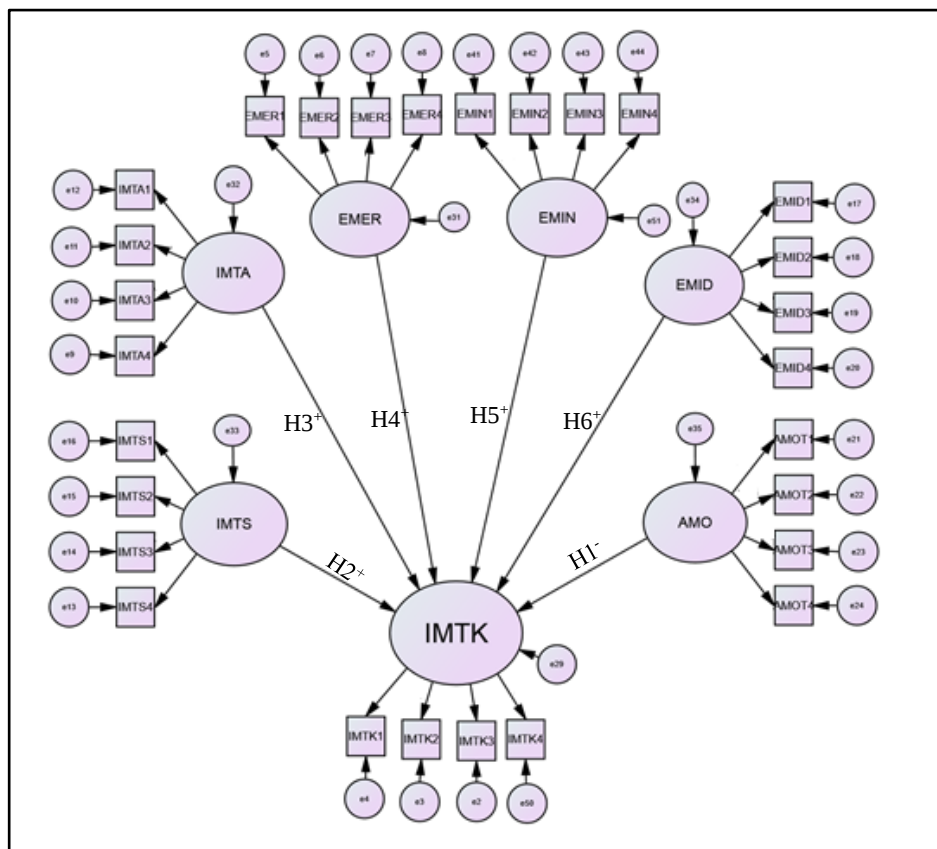
We tested the same research model against the different study groups and differing only the sample in accordance with the group undergoing testing (Figure 2). Thus, the research model is common to both groups. Of the total sample of 1923 students, there stemmed the two major groups subject to research analysis: GG(n=1011) and CG(n=912). The general expression of the model thereby tested is the following:

$$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_k X_k + \varepsilon_i, i=1,2,\dots,n$$

Recourse to SPSS software enabled the determination of just which of the independent variables introduced justified inclusion in the regression equation. This study applies IMTK as a dependent variable in linear regression with the independent variables of AMOT, EMER, EMIN, EMID, IMTA and IMTS. The corresponding research model to test the hypotheses previously defined is the following:

$$\text{Intrinsic Motivation to Know (IMTK)} = B_0 + B_1 \text{AMOT} + B_2 \text{EMER} + B_3 \text{EMIN} + B_4 \text{EMID} + B_5 \text{IMTA} + B_6 \text{IMTS} + \varepsilon$$

Figure 2. Research Model



RESULTS AND DISCUSSION

In order to compare the differences in motivation encountered in the sample under study, we have to divide it in accordance with the methodology applied. As this involved the collection of initial data on the motivation of all student participants before subsequently dividing the sample into GG and CG, we need to grasp whether there are any increases in motivation within each group between M1 and M2 and then carry out comparative analysis of the motivations in M2 between GG and CG. In order to make these comparisons, we made recourse both to descriptive statistics and to MLR that enabled the testing of diverse models that may then demonstrate just which variables held significance for increasing motivational levels and as well as their results across the diverse scenarios tested.

The answer options provided by the Likert Scale range from 1 to 7 with an average equal to 4 for any subscale meaning that the affirmation moderately corresponds to the opinion of the person questioned while between 5 and 6 greatly corresponds and 7 entirely corresponds. Therefore, for the EMOT and IMOT scales, a score of equal to or greater than four points represents students displaying higher levels of motivation. On the contrary, a high score on the AMOT scale means that students are less motivated as the ranking of this scale runs counter to those of the EMOT and IMOT scales.

Gamified Group vs the Control Group – Moment 1 and Moment 2

Descriptive Statistic

Table 3 sets out the descriptive statistic that conveys the differences in motivation between M1 and M2 and correspondingly reporting that, following the application of the gamified resource, the GG experienced a decrease in their level of demotivation from 2.315 to 1.864 while the CG underwent a rise in demotivation from 1.833 to 2.615. As regards the EMOT of the GG, there was a rise over the period from M1 to M2 across the EMER and EMIR dimensions while the CG returned a rise in EMIN and a reduction in EMER and EMID. Finally, the GG IMOT rose across every dimension from M1 to M2 while the CG only saw the IMTK dimension reduce over the M1 to M2 period.

Comparing the global data between GG and CG, we may state that the gamified resource ensured a reduction in the demotivation towards learning with this not proving the case with the CG that did not engage in any interactions with this learning tool (Faiella & Ricciardi, 2015; Hamari & Koivisto, 2013). EMOT experienced a greater rise in the GG than in the CG and IMOT registered rises across all dimensions in the GG while the CG went through a reduction in IMTK.

One interesting facet for analysis is the fact that EMIN declined from M1 to M2 in the GG and rose in the CG, which reflects how GG students did not feel pressured by third parties to apply the resource and applied the tool on their own will while the CG students acted under the pressure of having to learn in order to obtain success and displaying a behaviour that did not result from their own choices (Deci & Ryan, 2012).

As regards IMOT, the GG students acted according to their own will in their learning that resulted from their pleasure and satisfaction with the activities developed. In turn, the CG students, despite reporting better M2 results for IMTA and IMTS, saw their IMTK result drop from M1 to M2 with this fact justified by not

engaging in the tasks only for the pleasure and satisfaction experienced (Deci & Ryan, 2008).

Table 3. Average, standards deviation, asymmetry and kurtosis

Dimensi ons	Moment 1				Moment 2			
	Mean	Standard Deviation	Asymm etry	Kurtosis	Mean	Standard Deviation	Asymm etry	Kurtosis
AMOT (GG)	2.315	1.627	1.090	-.116	1.864	1.254	1.738	2.282
AMOT (GC)	1.833	1.294	1.780	2.251	2.615	1.796	.730	-.870
EMER (GG)	4.288	1.313	-.172	-.514	4.541	1.394	-.547	-.047
EMER (GC)	4.426	1.274	-.296	-.457	4.389	1.446	-.457	-.179
EMIN (GG)	3.691	1.329	.049	-.446	4.019	1.376	-.244	-.338
EMIN (GC)	3.860	1.392	-.056	-.594	3.947	1.390	-.270	-.474
EMID (GG)	5.094	1.190	-.436	-.291	5.060	1.384	-.726	.046
EMID (GC)	5.267	1.096	-.436	-.079	5.029	1.444	-.699	-.046
IMTA (GG)	4.222	1.185	.033	-.445	4.444	1.476	-.359	-.442
IMTA (GC)	4.302	1.193	-.010	-.401	4.395	1.428	-.309	-.301
IMTK (GG)	4.497	1.198	-.215	-.217	4.573	1.440	-.486	-.232
IMTK (GC)	4.646	1.162	-.199	-.230	4.598	1.396	-.636	.116
IMTS (GG)	3.473	1.193	.234	-.238	3.820	1.420	-.021	-.807
IMTS (GC)	3.581	1.166	.150	-.130	3.710	1.318	.016	-.525

Multiple Linear Regression

In order to statistically explain the most robust data referred to above, we carried out data analysis on the GG and CG data for M1 and M2 through multiple linear regression models and testing the four following models: (1) Intrinsic Motivation to Know Moment 1 Gamified Group (MIAM1GG); (2) Intrinsic Motivation to Know Moment 1 Control Group (MIAM1CG); (3) Intrinsic Motivation to Know Moment 2 Gamified Group (MIAM2GG); (4) Intrinsic Motivation to Know Moment 2 Control Group (MIAM2CG).

We applied MLR with a selection of variables in order to obtain a parsimonious model that explained IMTK in accordance with its independent variables (AMOT, EMER, EMIN, EMID, IMTA and IMTS). We analysed the assumptions of the various models referred to above, in particular those for normal distribution, homogeneity and independence of errors. We validate the first two assumptions graphically and with the assumption of independence validated according to the Durbin-Watson test. We also deployed VIF to diagnosis the presence of multicollinearity and then eliminating any variable with high levels of collinearity. Table 4 displays the results for the four tested models:

Table 4. Linear Regression Models

Dependent Variable: IMTK								
Model	Moment 1				Moment 2			
	MIAM1GG (n=1011)		MIAM1GC (n=912)		MIAM2GG (n=1011)		MIAM2GC (n=912)	
	B	t	B	t	B	t	B	t
(Constant)	,065	,682	,124	1,082	,073	,722	,045	,427
AMOT	-,090***	5,404	-,109***	5,832	-,019	1,271	,079***	5,276
EMER	-,054**	-2,814	-,037	-1,627	,039	1,606	-,087***	-3,701
EMIN	-,004	-,174	,015	,672	,043	1,722	,046	1,784
EMID	,324***	13,688	,346***	11,926	,254***	8,570	,365***	13,668
IMTA	,421***	15,820	,313***	10,951	,473***	15,899	,451***	14,168
IMTS	,312***	13,802	,351***	14,201	,187***	7,770	,195***	6,865
VIF	[1.260 – 2.961]		[1.317 – 2.625]		[1.395 – 4.686]		[1.387 – 2.425]	
R	,875		,838		,895		,874	
R ²	,765		,703		,800		,765	
R ² a	,764		,701		,799		,679	
Durbin-Watson	1.857		1.803		2.135		1.403	

p< 0.05 *p<0.001

The models tested returned statistically significant differences and powers of explanation, verifying the final models as detailed below:

Model MIAM1GG

MLR enabled the identification of the variables AMOT($\beta=-0.090$; $t(1004)=5.404$; $p<0.001$), EMER($\beta=-0.540$; $t(1004)=2.814$; $p<0.05$), EMID($\beta=0.324$; $t(1004)=13,688$; $p<0.001$), IMTA($\beta=0.421$; $t(1004)=15,820$; $p<0.001$) and IMTS($\beta=0.312$; $t(1004)=13.802$; $p<0.001$) as significant predictors for IMTK. Our final model is thus MIAM1GG= 0.065 - 0.090 AMOT - 0.054 EMER + 0.324 EMID + 0.421 IMTA + 0.312 IMTS. This model is highly significant and explains a high proportion of IMTK ($R^2 a=76.4\%$).

Model MIAM1CG

MLR enabled the identification of the variables AMOT($\beta=-0.109$; $t(905)=5.832$; $p<0.001$), EMID($\beta=0.346$; $t(905)=11.926$; $p<0.001$), IMTA($\beta=0.313$; $t(905)=10,951$; $p<0.001$), IMTS($\beta=0.351$; $t(905)=14.201$; $p<0.001$) as significant predictors for IMTK. Our final model is thus MIAM1CG= .124 - .109 AMOT + .346 EMID + .313 IMTA + .351 IMTS. This model is highly significant and explains a high proportion of IMTK ($R^2 a=70.1\%$).

Model MIAM2GG

MLR enabled the identification of the variables EMID($\beta=0.254$; $t(1004)=8.570$; $p<0.001$), IMTA($\beta=0.473$; $t(1004)=15.899$; $p<0.05$) and IMTS($\beta=0.187$; $t(1004)=7,770$; $p<0.001$) as significant predictors for IMTK. Our

final model is thus $MIAM2GG = .073 + .254 EMID + .473 IMTA + .187 IMTS$. This model is highly significant and explains a high proportion of IMTK ($R^2 a = 79.9\%$).

Model MIAM2CG

MLR enabled the identification of the variables $AMOT(\beta = 0.079; t(905) = 5.276; p < 0.001)$, $EMER(\beta = -0.087; t(905) = -3.701; p < 0.001)$, $EMID(\beta = 0.365; t(905) = 13.668; p < 0.001)$, $IMTA(\beta = 0.451; t(905) = 14.168; p < 0.001)$ and $IMTS(\beta = 0.195; t(905) = 6.865; p < 0.001)$ as significant predictors for IMTK. Our final model is thus $MIAM2CG = .045 - .079 AMOT - .087 EMER + .365 EMID + .451 IMTA + .195 IMTS$. This model is highly significant and explains a high proportion of IMTK ($R^2 a = 67.9\%$).

Analysis of the results and hypothesis

Analysis of the models enables us to verify how, in relation to the GG, the model obtained for M2 (MIAM2GG) with $R^2 a = 0.799$ generates a higher explanatory power than that for M1 (MIAM1GG) with $R^2 a = 0.764$. However, in the CG, exactly the opposite happens. We may also verify how the AMOT dimensions no longer holds any influence from M1 to M2 in the GG while nevertheless remaining statistically significant in both moments for the CG. This demonstrates how demotivation remains influential in the IMTK of the student group that made no recourse to the gamified tool, with a negative impact on this dimension, corroborating H1 proposed with negative direct impact of AMOT dimension in students motivation to know, to study and to understanding the curricular units contents (Deci & Ryan, 2008). We validate H2, there is also a statistically significantly influence on IMTK of IMTS at a level of 18.7%, hence students demonstrate their intrinsic will towards deploying the game in order to stimulate their own learning (Deci & Ryan, 2008). IMTK is also subject to an influence from IMTA of 47.3%, corroborating H3 proposed in model, which demonstrates the desires of students to utilise the resource for pleasure, satisfaction and to stimulate the learning this bestows upon them.

In turn, when analysing the CG linear regression model in M2, we find only the low levels of influence on IMTK of EMER, with an 8.7% influence, validating H4. However, there is a positive influence of EMID (36.5%) validating H5. Finally, reading of the GG linear regression models enables the verification of how IMTK, following the application of the gamified resource in M2 receives a 25.4% influence by EMID, corroborating H6 proposed, which conveys how students identified with the value of the activities incorporated into utilisation of the gamified resource, accepting its importance for their learning and regulating their behaviours as regards this utilisation (Deci et al., 2001).

Following analysis of the differences between both models, we concluded that in M2, the GG returned a 9.7% higher IMTK than the CG group that stems from the differences between the results of the MIAM2GG - MIAM2GG models. Hence, we may ascertain that the student group making recourse to the gamified tool experienced a boost to their motivation of 9.7% in comparison with the students group that did not gain the opportunity to apply this tool in their learning (Faiella & Ricciardi, 2015; Hamari & Koivisto, 2013).

In relation to their motivation for studying, for the first time, these higher education CUs have students that report feeling more extrinsically motivated than intrinsically motivated and correspondingly revealing fairly low levels of

demotivation. Hence, it is fundamental that this extrinsic motivation does not impact on the need for personal or intrinsic motivation (Ryan & Deci, 2000a). The results of this study report a higher level of IMOT than of EMOT and thereby corroborating earlier studies applying AMS to evaluate student motivation (Ratelle, Guay, Vallerand, Larose, & Senécal, 2007; Stover et al., 2012).

The general rise in the GG motivation over the course of the semester ran counter to earlier studies that referred to motivation as tending to slide over the course of time but, as regards the CG that did see its motivation decline, this does align with the conclusions of the aforementioned studies. We may explain this rise in GG levels of motivation through the modifications introduced into the learning environment through the gamified resource. This resource may have contributed to the increase in the intrinsic and extrinsic motivation levels of these students. Furthermore, the diverse situations taking place over this period, essentially the aspects of the performance levels obtained in the CUs may have contributed to the differences registered in these results. These results are in keeping with the theoretical assumptions of SDT when stating that meeting the basic psychological needs may foster improvements to the intrinsic and extrinsic levels of motivation (Black & Deci, 2000; Hagger, Sultan, Hardcastle, & Chatzisarantis, 2015; Kiemer, Gröschner, Pehmer, & Seidel, 2015; Vaino, Holbrook, & Rannikmäe, 2012).

CONCLUSIONS

The research study carried out enabled us to understand the differences in motivation towards studying CUs from the scientific field of Management among two distinct groups of students who, for the first time in the 2017/2018 academic year, attended the subjects of Accounting and Marketing within a higher education context. The total sample of 1923 students, drawn from a total population of 3567 students, was divided into two groups that then received differentiated learning methodologies. The CG, made up of 912 students, did not receive any change in the teaching-learning process and correspondingly maintaining the traditional methodology while the GG, containing 1011 students, experienced the introduction into their teaching-learning processes, and in addition to the traditional methodologies, the deployment of a gamified tool adopted as a complementary means of learning.

Both groups filled in the AMAMS questionnaire, which resulted from adapting the AMS scale put forward by Vallerand et al. (1992), in two distinct and different moments, at the beginning of classes - M1, and at the end of classes - M2. Furthermore, the questionnaire remained exactly the same for both groups across both moments and for both the GG with exposure to gamified resources and for the CG without any such experience of any additional learning tool. To this end, we evaluated the diverse dimensions that make up such types of motivation and demotivation (AMOT, EMOT and IMOT), which in turn break down into the various constructs that underpin the evaluation of motivation in accordance with SDT. The deployment of these theoretical constructs on students attending the Accounting and Marketing CUs provided evidence that the original research applying SDT is applicable to the motivational facets interrelated with learning in these CUs.

It is important to refer that the motivation based on the use of educational games is not the only way to achieve the desired results, despite its importance

and encouraging results. Hence, the traditional teaching method, properly led by the teachers, is still essential; it is necessary to understand the best way to merge the two methods in order to effectively teach the program content and reach greater engagement from the students.

In general terms, students reported positive indices for extrinsic and intrinsic motivation in relation to studying these CUs, however, the GG students registered higher levels of motivation for the study of these respective CUs. In fact, between M1 and M2, the GG students saw their level of demotivation drop in comparison with the CG students among whom demotivation towards learning increased over this period. As regards extrinsic motivation, both groups returned increases even while the GG reported a higher average rise. In the case of intrinsic motivation, the GG group saw every type of IMOT rise over the period between M1 and M2 while in the CG group, this did not rise across every facet. The positive effects on learning within both management areas supported the occurrence of a positive involvement of the students (Shernoff, 2013) revealing that the motivation state may be an important antecedent of learning (Reese, 2015).

In global terms, between M1 and M2, the GG saw AMOT decrease and EMER, EMIN, IMTA, IMTK and IMTS all rise that reflects both how demotivation decreased, and extrinsic and intrinsic motivation increased. Despite this, the EMID construct belonging to the EMOT dimension did experience a decline from M1 to M2 in the GG. As regards the CG, the non-application of the gamified resource may have contributed in some way to increasing demotivation as conveyed by the rise in AMOT and also in the slide in extrinsic motivation as reported by the drop in EMER and EMID as well as in the intrinsic motivation with a corresponding fall in the IMTK result. Regarding the hypothesis model tested, it explained a rather large proportion of variance of the dependent variables. In general, most of the variables were highly connected, creating a strong impact on motivation to know.

When applying the linear regression models to estimate the underlying IMTK constructs, we immediately verified that the four tested models were statistically significant and explained a good percentage proportion of IMTK. Furthermore, this also reported how in the GG, between M1 and M2, the AMOT variable lost its significance and thereby removed from the motivation to know construct. For the CG, this dimension measuring demotivation remained significant and brought about a reduction in IMTK. This demonstrates how the demotivation indices for the GG lost their effect on the Motivation construct while continuing to be significant in the case of the CG. As regards EMOT, we may state that the dependent EMID variable held the greatest importance to the construction of motivation for both the GG and the CG even while the IMOT, IMTA and also the IMTS dimensions also held relevance to the motivation of both groups. All the models tested attained high levels of significance and depicted a high proportion of the Motivation even while the models returned by the GG achieve a higher percentage level of explanation (MIAM1GG=76.4% against MIAM1CG=70.1%) and (MIAM2GG=79.9% against MIAM2CG=67.9%).

The achieved results also allow us to conclude that the dimensions which affect motivation level of Accounting students' who used the *Accountinggame* and Marketing students who used *Marketinggame* were AMOT with negative effect in IMTK and EMID, EMIN, EMER, ITA and IMTS with positive and statistically significant influence in IMTK. These results demonstrate that student motivation

can be increased by using innovative teaching strategies to grow up student motivation levels.

This study was therefore able to demonstrate differences in motivation for learning between students that applied complementary teaching resources in comparison with those students who did not and thus also demonstrates the feasibility of conjugating the traditional teaching dimension with gamification based tools to the extent that the latter seem susceptible to driving important increases in motivation that may eventually bring about differences in the subsequent academic results. In other words, whenever the increase in motivation generated proves able to facilitate learning, we may consider that the deployment of this type of tool may enable learning within the higher education context. Study suggests that educational games may, in fact, be an effective means to create motivation conditions, which may facilitate games-based learning. This study also contributes to the growing body of literature concerning the importance of gamification in teaching, in general, and in the management areas, in particular.

LIMITATIONS AND FUTURE RESEARCH PROPOSALS

The present study contains certain limitations from the outset due to the research focusing only on two areas of management and excluding many others that might also be subject to consideration. The sample, despite being robust and representing 53.91% of students who, in the 2017/2018 academic year, took the Accounting and Marketing CUs for the first time at higher education institutions and 83.33% of such students attending public HEIs, might still have been more representative had a larger number of HEIs and their students agreed to participate in this research project. We would also highlight the number of students who agreed to participate, completing the initial questionnaire (M1) but who did not subsequently complete the final questionnaire (M2) and thus required excluding from the sample.

As is common to studies evaluating motivation, that the rankings are self-reported might lead to bias in their reporting of reality due to a lack of self-awareness regarding the facets studied. Furthermore, in this case, with the evaluation of motivation, various factors of a personal and academic nature may have taken place over the course of the academic year and susceptible to eventually interfering and influencing some of the results obtained.

As proposals for future research, we would here recommend the replication of this study for other types of CU interrelated with the management academic field while also not excluding the scope for its application to other, completely different, scientific fields whenever undertaken simultaneously with the appropriate adaptations to the gamified tools. Another proposal would be to ascertain the levels of motivation prevailing in M1 and M2 in the GG and the CG samples but differentiating the results in relation to gender, age, and academic background so as to evaluate how sociodemographic differences might influence the motivations around learning with and without gamified tools.

Finally, we would propose carrying out a study of private HEIs in order to compare the results returned by the private sector with those of public institutions.

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APPENDIX

Table 1. Original and modified items of the Academic Motivation Scale

Items	Original Scale (AMS)	Modified Scale (AMAMS)
Question	Why do you go to college?	Why do you spend your time studying Accounting/Marketing
AMOT1	Honestly, I don't know; I really feel that I am wasting my time in school.	Honestly, I don't know; I really feel that I am wasting my time studying Accounting/Marketing.
AMOT2	I can't see why I go to college and frankly, I couldn't care less.	I can't see why I study Accounting/Marketing and frankly, I couldn't care less.
AMOT3	I don't know; I can't understand what I am doing in school.	I don't know; I can't understand what I am doing studying Accounting/Marketing.
AMOT4	I once had good reasons for going to college; however, now I wonder whether I should continue.	I'm not sure. I do not see how Accounting/Marketing could be important to me
EMER1	Because with only a high-school degree I would not find a high-paying job later on.	Because only with a good grade in Accounting/Marketing, will I find a high paying job later on.
EMER2	In order to obtain a more prestigious job later on.	In order to be able to get a job later on.
EMER3	Because I want to have "the good life" later on.	Because I want to have a good life later on
EMER4	In order to have a better salary later on.	In order to have a better salary later on.
EMIN1	Because of the fact that when I succeed in college I feel important.	Because of the fact that when I succeed in everything that is related to Accounting/Marketing I feel important
EMIN2	To prove to myself that I am capable of completing my college degree.	To prove the others (teachers, relatives, friends) that I can be good at Accounting/Marketing.
EMIN3	To show myself that I am an intelligent person.	To show myself that I am an intelligent person.

EMIN4	Because I want to show myself that I can succeed in my studies.	Because I want to show myself that I can succeed in everything that has to do with Accounting/Marketing.
EMID1	Because I think that a college education will help me better prepare for the career I have chosen.	Because I think that Accounting/Marketing will help me better prepare for the career I have chosen.
EMID2	Because eventually it will enable me to enter the job market in a field that I like.	Because studying Accounting /Marketing will prove useful for me later on.
EMID3	Because I believe that a few additional years of education will improve my competence as a worker.	Because I believe that Accounting/Marketing will improve my competence as a worker.
EMID4	Because this will help me make a better choice regarding my career orientation.	Because what I learn in Accounting/Marketing will be very useful throughout my course.
IMTA1	For the pleasure I experience while surpassing myself in my studies.	For the pleasure I experience while surpassing myself in Accounting/Marketing.
IMTA2	For the satisfaction I feel when I am in the process of accomplishing difficult academic activities.	For the satisfaction I feel when I am in the process of accomplishing difficult academic activities related to Accounting/Marketing.
IMTA3	For the pleasure that I experience while I am surpassing myself in one of my personal accomplishments.	Because I want to know about Accounting/Marketing.
IMTA4	Because college allows me to experience a personal satisfaction in my quest for excellence in my studies.	Because I experience personal satisfaction if I am knowledgeable about Accounting/Marketing.
IMTK1	Because I experience pleasure and satisfaction while learning new things.	Because I experience pleasure and satisfaction while learning new things about Accounting/Marketing.
IMTK2	For the pleasure I experience when I discover new things never seen before.	For the pleasure I experience when I discover new things about Accounting/Marketing that I had never learned before.
IMTK3	For the pleasure that I experience in broadening my knowledge about subjects which appeal to me.	For the pleasure that I experience in broadening my knowledge about Accounting/Marketing.
IMTK4	Because my studies allow me to continue to learn about many things that interest me.	Because studying Accounting/Marketing allows me to learn about many things in this area.
IMTS1	For the intense feelings I experience when I am communicating my own ideas to others.	For the intense feelings I experience when I am communicating my own ideas about Accounting/Marketing to others
IMTS2	For the pleasure that I experience when I read interesting authors.	For the pleasure that I experience when I learn how things work due to the agency of Accounting/Marketing.
IMTS3	For the pleasure that I experience when I feel completely absorbed by what certain authors have written.	For the pleasure that I experience when I feel completely absorbed by what the main researchers on Accounting/Marketing have written.
IMTS4	For the "high" feeling that I experience while reading about various interesting subjects.	For the "high" feeling that I experienced when I read several interesting studies on Accounting/Marketing.
AMOT: Amotivation; EMER: Extrinsic Motivation External Regulation; EMIN: Extrinsic Motivation Introjection; EMID: Extrinsic Motivation Identification; EMIR: Extrinsic Motivation Integrated Regulation; IMTK: Intrinsic Motivation To Know; IMTA: Intrinsic Motivation To Accomplish; IMTS: Intrinsic Motivation To Stimulate		

Table 2. Sample characterisation

Higher education institutions	Course	Population	<u>M1</u>		<u>M2</u>		<u>Group</u>	
			M	F	M	F	GG	GC
Polytechnic Institute of Guarda	Management	40	11	29	11	29	28	12
Polytechnic Institute of Bragança		84	35	40	35	40	48	27
Polytechnic Institute of Coimbra		20	--	--	--	--	--	--
Polytechnic Institute of Leiria		110	--	--	--	--	--	--
Polytechnic Institute of Lisboa		195	49	85	49	85	0	134
Polytechnic Institute of Portalegre		67	9	8	9	8	17	0
Polytechnic Institute of Viana do Castelo		90	35	23	35	23	38	20
ISCTE - University Institute of Lisbon		200	46	32	46	32	54	24
University of Beira Interior		57	30	27	30	27	0	57
University of Madeira		30	12	18	12	18	20	10
University of Aveiro		40	21	10	21	10	31	0
Coimbra School of Economics		89	26	23	26	23	0	49
University of Évora- School of Social Sciences		64	22	47	22	47	50	19
Lisbon School of Economics and Management		210	30	48	30	48	67	11
University of Trás-os-Montes e Alto Douro		38	16	22	16	22	24	14
University of Algarve		140	15	34	15	34	44	5
University of Minho		73	22	35	22	35	35	22
Porto School of Economics		122	45	76	45	76	77	44
Azores School of Economics and Management		27	12	15	12	15	20	7
Lisbon New School of Economics		210	--	--	--	--	--	--
ISCTE - University Institute of Lisbon	Economics	80	15	20	15	20	0	35
University of Beira Interior		45	15	26	15	26	0	41
University of Madeira		45	16	24	16	24	30	10
University of Aveiro		48	27	21	27	21	0	48
Coimbra School of Economics		154	12	20	12	20	0	32
University of Évora- School of Social Sciences		37	10	12	10	12	15	7
Lisbon School of Economics and Management		170	65	101	65	101	89	77
University of Trás-os-Montes e Alto Douro		36	13	23	13	23	36	0
University of Algarve		25	5	15	5	15	20	0
University of Minho		79	21	56	21	56	45	32
Porto School of Economics		223	26	40	26	40	28	38
Azores School of Economics and Management		25	10	15	10	15	0	25
Lisbon New School of Economics		210	--	--	--	--	--	--
Total		3083	671	945	671	945	816	800

Higher education institutions	Course	Population	<u>M 1</u>		<u>M2</u>		<u>Group</u>	
			M	F	M	F	GG	GC
Polytechnic Institute of Guarda	Marketing	26	16	17	16	17	20	13
Polytechnic Institute of Bragança		34	15	12	15	12	18	9
Polytechnic Institute of Leiria		42	--	--	--	--	--	--
Polytechnic Institute of Setúbal		58	25	33	~25	33	40	18
Polytechnic Institute of Viseu		42	--	--	--	--	--	--
Polytechnic Institute of Porto		121	20	65	20	65	60	25
University of Beira Interior		33	21	12	21	12	25	8
University of Aveiro		50	--	--	--	--	--	--
University of Algarve		30	14	16	14	16	17	13
University of Minho		48	14	27	14	27	15	26
Total		484	125	182	125	182	195	112

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