Motivation and Learning Strategies' Evaluation in Higher Education Portuguese Engineering Students

Rita Melo[1], Rui Mendes[2], Isabel Sá[3], Isabel Gonçalves[4] & Ana Lucas[5]

[1] Technical University of Lisbon, Instituto Superior Técnico, Pedagogical Counseling, Tutoring Programme
[2] Technical University of Lisbon, Instituto Superior Técnico, Studies and Planning Office
[3] University of Lisbon, Faculty of Psychology
[4] Technical University of Lisbon, Instituto Superior Técnico, Pedagogical Counseling, Tutoring Programme
[5] Technical University of Lisbon, Instituto Superior Técnico, Studies and Planning Office

Authors contacts:
rita.melo@ist.utl.pt
rui.mendes@ist.utl.pt

Abstract Intervention in Higher Education's academic achievement benefits from the use of tools that can easily identify some of the variables present in students' motivation and learning strategies. The Motivated Strategies for Learning Questionnaire – MSLQ – constitutes such tool and was for that purpose adapted to Portuguese engineering students by analysing MSLQ scales' acceptability and levels of internal consistency. From the original 81-item version, a 28-item version was obtained to assess students' motivation and learning strategies while attending a course they perceive as being difficult to complete. The validation of this short version questionnaire resulted in a reliable and fast identification of the dimensions involved in motivation and learning strategies. Implications and possibilities of the use of MSLQ as a tool for promoting Portuguese engineering students' academic achievement are discussed.

Introduction

The transition from Secondary Education to Higher Education (HE) has been a permanent concern of Higher Education Institutions for verifying that students frequently arrive ill equipped to face University's academic challenges. Specifically, HE students are expected to become autonomous in their learning process in order to succeed as future professionals and citizens. In this context, Universities can help prepare their students for success by offering them tools that can promote self-regulated learning. This can be achieved through the identification of the learning strategies students use and the ones they should develop.

The Motivated Strategies for Learning Questionnaire (MSLQ - Pintrich et al., 1991) has been widely used with the purpose of evaluating students' perception of their motivation and learning strategies towards a specific course unit (for a meta-analysis of studies with MSLQ see Harris, Edmundson and Jacobson, 2006). This self-assessment survey is based on a socio-cognitive perspective, which considers students as active agents in processing information (Duncan and McKeachie, 2005). The MSLQ questionnaire allows students to increase their self-awareness and obtain greater perception of their strengths and weaknesses as HE students. Also, MSLQ allows professors to obtain feedback from students on adjustments deemed necessary to the course unit they teach. This pilot study aims at adapting the MSLQ to Portuguese engineering students to provide students with a tool that can help them facing HE's academic challenges and excel. Furthermore, this study intends to analyse students' perceived motivation and learning strategies when attending courses they consider easy to complete and courses they consider difficult to complete.

MSLQ characteristics

The MSLQ contains 81 items and is divided in two main parts: motivation and learning strategies, covering a set of 15 scales. The MSLQ is a self-report instrument and it takes approximately 15 to 20 minutes to complete (Pintrich *et al.*, 1991). Each item is evaluated on a 7-point Likert scale, from 1- "not at all true for me" to 7- "very true for me". The result in each scale derives from the average of its items. There are 6 motivation scales that assess students' beliefs and objectives for a course unit, these are *Intrinsic Goal-orientation, Extrinsic Goal-Orientation, Task Values, Control of Learning Belief, Self-efficacy for Learning and Performance*, and *Test Anxiety*. The 9 learning strategies scales assess the use that students make of different cognitive and metacognitive strategies, as well as resources management. They are *Training/Repetition, Elaboration, Organization, Critical Thinking*, and *Metacognitive Self-regulation, Time Management and Study Environment, Effort Regulation, Peer Learning*, and *Help Seeking*.

Methods

Sample

Participants were IST students from the 3rd and 4th year, attending different courses and present in classrooms at the time data were collected. All students who did not provide their student number while filling in the questionnaire were excluded from the final sample. When these participants were included in the sample, Cronbach's α values were lower than when they were excluded. As such, these students showed a general tendency to be less committed as regards to the answers given, increasing the probability of biased answers. Another exclusion criteria was incomplete questionnaires. After excluding both cases (n=20), the sample totalled 177 student – 72.2% men – with an average age of 21.79, and a course classification average of 13.1 on a 20 values' scale.

Procedures

The MSLQ questionnaire was translated to Portuguese and subsequently retroversed by a certified translator. The final version was independently reviewed and evaluated by three researchers. All students in the classroom at the time of data collection were invited to voluntarily fill in the survey and were informed that it was still at an adaptation phase. The MSLQ was then administered in classrooms taking 15 minutes on average to complete. Participants were also informed that results would only be disclosed for their own information in case an e-mail address was provided, guaranteeing results' confidentiality. In addition, socio-demographic variables were collect as well as students' opinion regarding MSLQ's length and clarity of content through a Likert-type scale from 1 'not adequate' to 5 'adequate'. Specifically, the following domains were assessed: (I) understanding/ clarity, (II) reading, (III) words used; and (IV) number of items.

Similar to Muis et al. (2007), MSLQ instruction was changed since the sample was composed by students attending different undergraduate courses. Students could then choose the course they wanted to focus on in order to complete the questionnaire. Thus, and unlike the original MSLQ, in which students should focus on a specific course (e.g. the course they are currently attending), 3 application groups were set up, according to the initially given instruction: the 'at random course' group where students received an instruction to focus on any course unit of their choice; the 'easy course' group, where students were instructed to focus on a course perceived as easy to attain; and the 'difficult course' group, where students should focus on a course perceived as difficult to complete. This design intends to determine if different instructions yield different patterns in students' perceived motivation and learning strategies.

Subsequently, the 3 groups' Cronbach's α ('difficult course', 'at random course' and 'easy course') were compared with Cronbach's α for the course that was chosen more often (*Materials Resistance* course), and with Cronbach's α obtained by Duncan and McKeachie (2005). The internal consistency of MSLQ's two parts - Motivation and Learning Strategies - was analysed by application groups in order to explore data behaviour in relation to these two fields in each group.

With regard to adequacy, understanding and analysis procedures of the Portuguese MSLQ items, three particular fields were evaluated: acceptability, internal consistency and scale structure. As for acceptability, results were analysed in relation to items understanding, clarity and reading, words used and number of items. The Cronbach's α was then used to evaluate the internal consistency of the scales that compose the MSLQ. In what concerns scale structure, a factorial analysis was conducted.

Results

The 81 items MSLQ version that was adapted revealed good acceptability. Most questionnaires were complete (92.5%), however roughly 70% of respondents gave an intermediate or negative value when evaluating the number of items, suggesting the need for a shorter version of the questionnaire. Regarding internal consistency, most motivation and learning strategies scales showed satisfactory results, although the values of α varied according to the application group. Nevertheless, in most scales the Cronbach's α is higher than 0.70 (Table 1).

With the purpose of confirming the item-scale relationships, a factorial analysis was conducted which gave us a low saturation of the factors in the original scales - with the varimax rotation, the dimensions found did not reproduce the referenced sub-scales. Given this situation, the possibility of reducing the number of items was considered in order to obtain a more consistent questionnaire in respect of the answer pattern (see table 2) and to improve MSLQ's acceptability.

All scales showing α values lower than .65 were withdrawn from the analysis. With regard to Motivation, the *Intrinsic Goal Orientation* sub-scale was deleted. As for the remaining ones, only the highest achievers remained (12 out of the 31 original items). Similar to what occurred with Motivation, a similar procedure was adopted to the Learning Strategies, where sub-Scales such as *Training, Effort Regulation, Peer Learning and Help Seeking* were deleted. Only the items that contributed the most to each sub-scale remained (16 out of the original 50).

Table 1. Alfa coefficients and items that compose the 15 MSLQ scales by application groups, Duncan and McKeachie (2005) sample and Material Resistance Course

Scales	α Duncan and McKeachie (2005)	α Materials Resistance N=55	α Random course N=47	α Easy course N=60	α Difficult course N=70
Motivation scales					
Intrinsic goal orientation	.74	.66	.74	.79	.59
Extrinsic goal orientation	.62	.55	.56	.59	.67
Task Value	.90	.91	.93	.90	.94
Control of Learning Beliefs	.68	.85	.76	.60	.83
Self-efficacy for Learning and Performance	.93	.87	.86	.87	.85
Test anxiety	.80	.61	.76	.67	.59
Learning Strategy Scales					
Rehearsal	.69	.61	.68	.75	.58
Elaboration	.75	.75	.39	.80	.76
Organization	.64	.77	.63	.90	.79
Critical thinking	.80	.80	.80	.84	.81
Metacognitive self-regulation	.79	.83	.72	.89	.80
Time and Study Environment Management	.76	.75	.47	.75	.69
Effort Regulation	.69	.55	.61	.37	.56
Peer Learning	.76	.76	.71	.85	.61
Help seeking	.52	.48	.46	.79	.43

Table 2. Item-scale analysis

Scales	N items	Cronbach alfa Alpha	Cronbach's Alpha Alfer item(s) deleted
Motivation scales			
Extrinsic Goal Orientation		.632	.790
Task Value		.642	.693
Control of Learning Behaviour		.635	.699
Self-Efficacy for Learning and Performance			
Elaboration		.686	.840
Test Anxiety		.881	.780
Learning Strategies			
Elaboration		.786	.774
Organization		.796	.856
Critical Thinking		.685	.786
Metacognitive self-regulation		.812	.673
Study Time and Environment		.686	.699

Discussion

The present research adapted an instrument that has proven to be a useful tool for screening students' motivation and their learning strategies (Pintrich et al., 1991). This version - MSLQ short version for Portuguese engineering students - showed high levels of unambiguousness and acceptability. Besides having had an item-reduction - allowing the questionnaire to be less time-consuming - the present adapted version of the MSLQ also adopted an instruction that specifically asks students to focus on a course they perceive as difficult to complete. Students can then easily receive their results through e-mail along with some feedback to improve their academic performance. Such self-assessment and feedback will allow students to increase their self-awareness about the characteristics necessary to meet HE's challenges.

The original version of 81 items was applied using 3 different instructions (i.e. to focus on any course of students choice, to focus on a course perceived as easy to complete, or to focus on a course difficult to complete). The instruction chosen for the Portuguese final version was for students to focus on a course they felt as being difficult to complete. This adaptation allowed to identifying more thoroughly the difficulties students reveal in academic performance.

The item-reduction analysis was a challenge excluding the scales with the largest explanatory sense. The option in this pilot study was to adapt the instrument to a specific population of engineering students and not to make an instrument with the highest comprehensive theoretical rates. This goal resulted in the development of specific instructions that allowed students to become more aware of their characteristics as HE students when facing a course perceived as difficult to attain and thus, to help them find the path to academic achievement in this condition. We based this option in a basic property of the instrument - the use of the modular scales.

In conclusion, the validation of the instrument through the factorial analysis procedure made it possible to establish that not all the items saturated in the original scales. Therefore, together with the assessment of the respondents regarding instrument understanding and length, the option made was to reduce the number of items. Besides making the collection of surveys less time consuming, this procedure also made it possible to obtain higher α values with the same data and, simultaneously, values closer to the original study. To minimize the possibility of error, the option was to delete the scales with α values lower than 0,65, so that the instrument could be made as accurate as possible. Nonetheless, some important original scales were excluded using this procedure (e.g. *intrinsic goal orientation*) making the 28-item final version a useful questionnaire but still in need for further refinement. In the future, we plan to further validate this MSLQ short version for Portuguese engineering students by applying it to a more extended sample than the one used in this original adaptation. We also plan to complement the data collected with other variables concerning self-regulation strategies used by students in different learning environments.

References
Duncan, T. G. & McKeachie, W. J. (2005). The Making of the Motivated Strategies for Learning Questionnaire. *Educational Psychologist*, 40(2), 117-128.
Harris, S., Edmundson, L., and Jacobson, R. (2006). Motivational and Learning Strategies of Community College Students. Paper presented at the *MidSouth Educational Research Association Annual Conference*. Birmingham, AL.
Muis, K., Winne, P., and Jamieson-Noel, D. (2007). Using a multitrait-multimethod analysis to examine conceptual similarities of three self-regulated learning inventories. *British Journal of Educational Psychology*, 77, 177-195.
Pintrich, P., Smith, D., Garcia, T., & McKeachie, W. (1991). *A Manual for the Use of the Motivated Strategies for Learning Questionnaire (MSLQ)*. Ann Arbor: The Regents of the University of Michigan.