Learning Strategies in Science Education

Relationship to Academic Achievement

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Introduction

Learning strategies can be understood as a sequence of specific activities that will enable the learner to gain new knowledge (Lewalter, 2003). Self-regulated learning has emerged as a construct that encompasses various aspects of academic learning and provides an overview of the skills, knowledge, and motivation that students acquire (Paris and Paris, 2001). The models of self-regulated learning consider that learning is an active and constructive process, and stress the importance of integrating both motivational components of learning and learning strategies (Wolters, Pintrich, and Karabenick, 2005).

Method

In the present work, a self-report instrument, the **Motivated Strategies for Learning Questionnaire** (MSLQ) (Pintrich, Smith, Garcia, and McKeachie, 1991) was used to obtain information on motivational components and use of different learning strategies in science of **365 Spanish high school students**. The questionnaire outcomes were related to students' academic scores in science.

Procedure

The MSLQ was translated into Spanish and adapted to an electronic format, permissions were requested and the science teachers were instructed on the administration of the questionnaire to their students.

The questionnaire was administered in a normal science class. Completion lasted less than 90 min. Excel and SPSS 24.0 were used to collect and to analyse data using descriptive and inferential statistics.

Objectives

1. **To know the self-perception of learning strategies, motivation, and resource management use in Spanish secondary school students when learning science**
2. **To analyze the influence of these three dimensions and their components on science achievement**
3. **To determine the components of these variables that have most impact on science achievement**

Results

Sections and components		Mean	SD
Motivation			
GO	Goal Orientation	5.17	1.06
EO	Extrinsic Goal Orientation	5.28	1.18
TV	Task Value	5.04	1.28
LB	Control of Learning Beliefs	5.13	1.06
SE	Self-Efficacy	5.08	1.19
TA	Test Anxiety	4.67	1.20
Motivational-Global		5.06	.84
Cognitive & Metacognitive Strategies			
R	Rehearsal	3.86	.88
E	Elaboration	4.89	1.01
O	Organization	5.01	1.34
CT	Critical Thinking	4.67	1.04
MR	Metacognitive Self-Regulation	4.83	.88
Cog&Metacog-Global		4.66	.81
Resource Management Strategies			
TE	Time And Study Environment	4.92	.84
ER	Effort Regulation	4.72	1.12
PE	Peer Learning	4.01	1.38
SO	Support Of Others (Help Seeking)	4.58	1.00
Management-Global		4.56	.70

Components significantly correlated with the achievement scores

Sections and components	Pearson's r
Motivation	
GO: Goal Orientation	0,14**
EO: Extrinsic Goal Orientation	0,24***
TV: Task Value	0,28***
LB: Control of Learning Beliefs	0,15**
SE: Self-Efficacy	0,41***
Cog. & Metacognitive Strategies	
R: Rehearsal	0,26***
E: Elaboration	0,20***
O: Organization	0,18***
MR: Metacognitive Regulation	0,26***
Resource Management Strategies	
TE: Time & study environment	0,29***
ER: Effort regulation	0,29***
SO: Support of others (or Help seeking)	0,18***

***: p< .001; **: p< .01

Influence on academic achievement

The MSLQ strategies together accounted for 27 percent of the variance of the students' academic scores in science.

Self-Efficacy was the component more strongly related to the academic achievement, thus having the greatest single contribution to explain the variance of students' marks (17 percent). This is a well-known result from previous studies.

Motivational components together explained almost 20 percent of the variance of students' scores in science; the cognitive & metacognitive components jointly explained 10 percent; and resource management components explained 13 percent of that variance.

Conclusions

1. MSLQ questionnaire seems usable with secondary students.
2. Cognitive and metacognitive strategies, motivation, and resource management influence the science achievement significantly
3. The motivational components in MSLQ have the greater impact on students' performance in science, being Self-Efficacy the variable with the highest influence

There is a need to investigate the effects of different instructional methods focusing on self-regulatory strategies

Aprendizaje