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The role of students' interests in self-regulated learning: The relationship between students' interests, learning strategies and causal attributions

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The purpose of this research was to examine the relationship between students' interests, their use of certain specific learning strategies and causal attributions which they made for their academic achievement. In this manner, we attempted to explore the relationships between some important variables from three different, but connected phases of self-regulated learning: the forethought phase (interests), the performance control phase (learning strategies) and the self-reflective phase (causal attributions).

Results confirmed the presumption that learning strategies could be a potential mediator in the relationship between students' interests and their academic achievement. Also, results indicate that the causal dimension of controllability could have a partial mediating role between students' academic achievement and their interests. Generally, our findings indicate a dynamic and cyclical nature of learning process – interest is an integral part of this process and it could be conceptualized as both a consequence and an antecedent of cognitive aspects of learning.

Introduction

Schunk (2001) defined self-regulated learning as learning that results from students' self-generated thoughts and behaviors that are systematically oriented toward the attainment of their learning goals. Self-regulated students are those who are metacognitively, motivationally and behaviorally active participants in their own learning process (Zimmerman, 2001).

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Although self-regulated learning is a relatively new concept in educational psychology, research on self-regulated learning has resulted in large areas of domain-specific knowledge about self-regulated learning, each covering specific aspects of self-regulated learning. As a result, models were developed which articulate specific links between different cognitive, motivational and emotional components of self-regulated learning [e.g., models of Zimmerman (2000), Pintrich (2003) and Pekrun (2000)]. According to Zimmerman (2000), a social cognitive perspective is distinct in that it views self-regulation as an interaction of personal, behavioural and environmental triadic processes which are proactively, as well as reactively, adapted for the attainment of personal goals. He pointed out that it is important to understand how these processes are structurally interrelated and cyclically sustained. This perspective differentiates three cyclical phases of self-regulation: a forethought phase, a performance or volitional control phase and a self-reflection phase. Taking into consideration Zimmerman's three-phase self-regulation model, Schunk (2001) emphasizes that various self-regulatory processes come into play during the different phases. Thus, in the forethought phase, which refers to influential processes that precede efforts to acts and set the stage for it, students set learning goals and plan and select strategies for attaining these goals. Underlying forethought processes of goal setting and strategic planning are self-motivational beliefs: self-efficacy, outcome expectations, intrinsic interest or valuing and goal orientation. During the performance control phase students focus on the task and optimize their effort, in addition, they track specific aspects of their own performance and the conditions that surround it and its effects. In this phase students implement learning strategies that affect motivation and learning. Throughout the self-reflective phase processes, students evaluate their performance (compare self-monitored information with a standard or goal) and make causal attributions for performance. The cyclical nature of these processes is demonstrated by the influence of the self-reflection phase on the subsequent forethought phase. Consequently, an essential feature of self-regulation is a self-oriented feedback loop in which students monitor the effectiveness of their learning attempts and respond to this feedback in a variety of ways, ranging from covert changes in self-perception, to overt changes in behaviour (Zimmerman, 2001).

Student's interests within the context of self-regulated learning

Among the motivational factors, interest-related variables turned out to have an important influence on the forethought phase, the performance control phase, as well as the self-reflective phase of self-regulated learning (Krapp, 1999). Sansone and Thoman (2005) point out that models of self-regulation typically include motivation in terms of goals, and place emphasis on extrinsic motivation and on the metacognitive variables which contribute to this goal-striving process. They suggest that monitoring and regulating our motivation, and not only our progress toward goals, are important aspects of self-regulation. In short, they recognise that in addition to monitoring the process toward goals, the process of monitoring how we feel is also an important part of self-regulation. In this context, the role of interest, especially the affective component of interest, is recognised. Most researchers define interest as a phenomenological experience involving both cognitive and affective components (Hidi, 2006; Sansone & Smith, 2000). The concept of interest, in the theoretical framework proposed by Schiefele and his colleagues, is defined as a person-object relation that is characterized by value commitment and positive emotional valences. Educational research distinguishes two types of interest: individual and situational interest (Hidi, 2006; Schiefele, 1991). Individual interest is defined as a relatively stable evaluative orientation towards certain domains (Schiefele, 1998) or towards particular classes of objects, events or ideas (Krapp, Renninger, & Hoffman, 1998). Individual interests have personal significance and are usually associated with high levels of knowledge and value, positive emotions and increased reference value (Krapp, Hidi, & Renninger, 1992). Individual interest develops and remains a stable and enduring factor in one's learning over an extended period of time. During interest-driven actions, the latent disposition (trait) becomes the actualised interest (state). This action is characterised by the experience of competence and personal control, the feeling of autonomy

and self-determination and a positive emotional state. Also, it can sometimes (in an optimal condition) be characterised by the experience of "flow" when the person and the object coincide (Köller, Daniels, & Baumert, 2000a; Köller, Schnabel, & Baumert, 2000b). Actualized interest must be distinguished from situational interest, which in contrast to actualised interest, is generated by external stimuli. Hidi (2006) noted that individual interests refer to both a predisposition and a psychological state, and that situational interests as well as individual interests, can be associated with the psychological state of interest. Hidi pointed out that the dual meaning of individual interests has not always been recognized in literature. It is important to consider individual interest as a sufficient, but not necessary condition of producing the psychological state of interest and to recognize the fact that situational interest can also elicit this state (Hidi, 2006). In this way, individual student's psychological state of interest could be generated both by task and predisposition, but another student could also experience the same psychological state triggered by the situation. An interactive view of interest proposes that while the potential for interest resides in the person, the environment and the content define the direction of interest and contribute to its development, that is, interest being content-specific. Hidi (2006) noted that this content-specific nature of interest differentiate interest from other motivational variables that centre on more general aspects of learning such as achievement goals. There are an increasing number of studies which try to explore the role of interest in the learning process. Results from empirical research in this area have demonstrated the positive effects of interest-based learning on academic achievement (see overview in Krapp, 2005). Research data not only confirm that interests impact students' attention, goals and level of learning, but that individual interests can help students overcome low ability and/or perceptual disabilities (Hidi, 2006). Pintrich and Schunk (1996) point out that despite the generally consistent positive findings of the role of interest in learning, future research should address the issue of how interest influences learning, not whether it has an effect on it. Similarly, Köller et al. (2000a,b) warn that previous studies in this field have neglected the issue of whether interest predicts achievement after controlling for difference in other variables such as learning strategies, cognitive ability or prior knowledge. They support these objections with empirical evidence which suggest that the relation between academic interest and achievement was moderated by changes in the instructional setting. Likewise Krapp (1999) stressed that only a few studies have tried to explore the effects of individual or situational interest by analyzing the relationship between interest and possible mediator variables, such as attention, learning strategies, flow, and feeling-related states. Recently, Ainley and Chan (2006) reported empirical findings that present interest as a mediator of associated self-regulatory processes such as self-efficacy and achievement goal orientation. Köller et al. (2000b) cautioned that in most studies, interest is treated as an independent variable and achievement as a dependent variable (achievement measures were typically grades and standardized test scores). However, the causal relation between academic interest and achievement could run in the opposite direction – achievement could affect interests. The assumption that achievement and/or self-perceived competence affect interest has been accepted by several authors. Deci and Ryan (1991, 2000, 2002), Harter (1982) and Baumert, Schnabel, and Lehrke (1998) support the assumption that students feel intrinsically oriented in areas in which they perceive themselves to be competent. Schunk (2001) noted that students motivated to attain a goal engage in self-regulated activities they believe will help them. In turn, self-regulation promotes learning and perception of greater competence sustains motivation and self-regulation to attain new goals. Cognitive and metacognitive strategies that students engage in play a crucial role in the construction of knowledge. With regard to acquired knowledge, students begin to take their field of interest more seriously, and learning efforts, as a result, are more concentrated on selected topics and, thereby, yield better learning results. Students who know more about the topic being studied will find it easier to learn more. Research carried out by Sansone and Smith (2000) demonstrated that through self-regulation students can develop interest in specific contents in which they had no previous interest. Due to these empirical findings and the theoretically proposed cyclical nature of self-regulated learning, the present study attempts to explore both directions of the causal relation

between academic interest and achievement. In addition, in accordance with Krapp (1999, 2002) an attempt is made to explore the effects of interest on academic achievement and also to analyze the relationship between interest and possible mediator variables such as learning strategies and causal attributions.

Learning strategies within the context of self-regulated learning

In Zimmerman's three-phase self-regulation model, the performance (volitional) control phase involves processes that occur during learning and affect attention and action. One of the key factors in this phase of self regulated learning is the students' ability to select, combine and coordinate learning strategies. Learning strategies are comprised of activities such as selecting and organizing information, rehearsing learning material, relating new information to information in memory, enhancing meaningfulness of material and creating or maintaining a positive learning climate (Schunk & Zimmerman, 2003). Zimmerman (2001) emphasizes that knowledge about strategies puts learners in a position to regulate their own learning, that is, knowledge about strategies gives learners better control over information processing. In a similar manner, Lapan, Kardash, and Turner (2002) pointed out that self-regulated learners actively apply a variety of learning strategies appropriate to specific learning tasks. Many researchers in this area have attempted to make taxonomies of the classes of actions (specific learning strategies) which learners use to learn, that is, to classify actions into different categories and label these categories. However, it is difficult to find agreement on what strategies are exactly and how many of them exist, in other words, how they should be defined, demarcated and categorised. Woods (1997) noticed that the term "strategy" in literature has come to refer not to what learners do, but to the researchers' generalized categories or classes of things they do. Paris and Cunningham (1995) also emphasised that there was no consensus on a single taxonomy of learning strategies. Nevertheless, despite this disparity, a number of theorists have agreed on three categories of learning strategies (Pintrich, Smith, Garcia, & McKeachie, 1993): cognitive strategies, metacognitive strategies and resource management strategies. Niemivirta (1996) distinguished between high-order learning strategies which are deep processing, such as elaboration, organization and self-monitoring strategies, and surface processing, which include strategies such as detail memorizing and rote learning strategies. Niemivirta found that learning oriented students reported using more higher-order learning strategies, in addition, school achievement was directly predicted by deep processing alone. Research, in the area of academic achievement situations, shows that higher achievers report a greater use of most of strategies than lower achievers (Chye, Walker, & Smith, 1997; Pintrich, 1989; Schiefele, Wild, & Krapp, 1995; etc.). Many cognitive and metacognitive strategies have been broadly researched and are recognized as effective ways of learning. In this study, learning strategies are considered mediating variables, which could be a possible explanation of the positive influence of interest-based learning on students' performance.

Causal attributions within the context of self-regulated learning

Many authors (Pintrich, 2003; Weinert, 1994; Zimmerman, 2001) have cautioned that an important factor of self-regulated learning is the ability of the student to appropriately interpret their success or failure. Weiner's (1992, 1996) attributional theory of motivation and emotion emphasises people's causal explanations of their experience (achievement) as the main determinants of the way they think, feel and behave. Weiner suggests that attribution for success or failure influences emotional reactions and success expectation, which would in turn influence motivation and subsequent performance. The theory proposes that the underlying dimensions of such causal attributions (locus, stability, control and globality) have distinct psychological and emotional consequences, furthermore, it should be noted that these proposed relationships were empirically confirmed in an academic field setting. A great deal of research indicates that the greatest motivational problems in the learning process, such as

passivity and apathy, are connected with the students' attributions of their failure to internal, stable and uncontrollable causes (e.g., lack of ability) (Niemivirta, 1996; Weiner, 1996). As a result, a number of authors suggest that students should be retrained to make internal, unstable and controllable failure attributions (e.g., insufficient effort). However, it is possible that hard-working, but unsuccessful students feel frustrated and hopeless if they make effort attributions for their failures. Schunk and Cox (1986; according to Schunk, 2001) show that, over a longer period, effort feedback for success on the same task could also lead students to doubt their capabilities and question why they still have to work hard to succeed. Therefore, these students should be directed to the cognitive processes or strategies they used while studying, rather than to the effort failure attributions. Similarly, Zimmerman (2000) warned that causal attribution judgments are crucial to self-reflection, as a result of the fact that attributions of failures to a fixed ability prompt learners to react negatively and discourage efforts to improve. Alternatively, self-regulated learners are more likely to understand poor performance as being due to insufficient effort or the implementation of ineffective learning strategies. Attributional judgments are important for the forethought phase as well. Learners who plan to use a specific learning strategy during the forethought phase, and make use of it during the performance phase, are more likely to attribute failures to that strategy rather than low ability. Since learning strategies are internal, controllable and unstable causes of failure, they are perceived as correctable and can, therefore, protect learners against negative self-reactions. Strategy attributions are considered highly effective in sustaining motivation as they sustain perceptions of efficacy until all possible strategies have been tested. In this dynamics cycle, it seems logical to propose that the effect of attained academic achievement on subsequent interest in learning subject could be mediated by causal attributions for that achievement. Thus, if academic failure is attributed to internal, uncontrollable and stable causes, such as lack of ability, interest in learning these topics would probably decrease, and students could direct their interest to other topics in which they perceive themselves to be competent. In other words, the mediating role of causal attributions in the relationship between the students' academic achievement (self-reflection phase) and their personal interests in study topics (subsequent forethought phase) could be proposed. Although the theoretical significance of causal attributions in self-regulated learning has been frequently cautioned (Schunk, 2001; Zimmerman, 2001), the complex role of causal attributions in self-regulated processes is still uncertain, especially with regard to the possible mediating role of this construct.

The purpose of this research was to examine the relationship between students' interests, their use of certain specific learning strategies and causal attributions, which they made for their academic achievement. In this manner, an attempt was made to explore a number of important variables and their relationships from three different, interdependent, but connected phases of self-regulated learning: interests (the forethought phase), learning strategies (the performance control phase) and causal attributions (the self-reflective phase). Krapp (1999) suggests that motivational analyses must go beyond the paradigm of prediction research and must include empirical approaches that explore the mediating effects in short term, as well as long term, learning situations. Accordingly, an effort was made to examine whether some of these variables have an important mediating role in the process of self-regulated learning. Specifically, in the conceptual framework of self-regulated learning, it is proposed that student's interests in their studies and their academic achievement have a reciprocal relationship that comprise of direct and indirect connections, and are mediated by other variables such as learning strategies or causal attributions (See Figure 1). Therefore, the present study attempts to address the following research issues:

- Whether higher achievers tend to report a greater use of most learning strategies than lower achievers,
- Whether learning strategies that are used mediate the relationship between students' interests and their academic achievement, and
- Whether causal attributions, which students made for their academic achievement, play a mediating role between students' academic achievement and their personal interests.

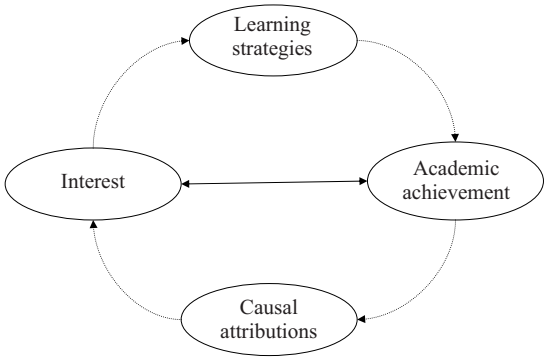

Figure 1. Theoretically proposed relationships between students' interests and their academic achievement

Method

Participants

A total of 176 students from the Faculty of Philosophy in Zadar, Croatia, participated in this study (mean age of 21.87 years). The higher proportion of girls (89,8%) in the sample is, partly, explained by a higher enrolment of girls at the Faculty of Philosophy. Due to the fact that testing the difference (one-way ANOVA) between female and male students did not show a significant difference in the examined variables, further analyses were done on the results of the whole sample.

Procedure

Firstly, students answered questions about the grade obtained in their last exam, which was taken two weeks before the research procedure (the Croatian academic grade scale ranges from 1-fail to 5-excellent). Secondly, three self-report questionnaires were applied: the Croatian version of "Fragebogen zum Studieninteresse (FSI)" (Schiefele, Krapp, Wild, & Winteler, 1993), the Croatian version of "Inventars zur Erfassung von Lernstrategien im Studium (LIST)" (Wild & Schiefele, 1994) and "The Causal Attribution Scale II" (Sorić, 2002). The questionnaires were administered, in random order, during regular class time.

Applied instruments

Interests. Following the Hidi's (2006) suggestion that the content-specific nature of interest differentiates interest from other motivational variables that centre on more general aspects of learning (such as achievement goals), a Croatian version of the Study Interest Questionnaire ("Fragebogen zum Studieninteresse (FSI)" (Schiefele et al., 1993) was used to assess the domain-specific interests of participants. The original questionnaire measures students' personal interests in their field of study and takes into consideration the following interest dimensions: emotional attitudes, personal value judgments and intrinsic character. This questionnaire was composed of 25 items that focused on students' enjoyment and value judgement of study activities and subjects for their own sake (sample item: *After a long weekend or vacation I look forward to starting to study again*). The students rated each item on a 4-point scale ranging from *not at all true for me* (1) to *very true* (4). One-factor structure of this scale was confirmed on this sample and Cronbach's alpha reliability coefficient was acceptable high (.905).

Learning strategies. Wild and Schiefele (1994) have developed an inventory for measuring learning strategies – "Inventars zur Erfassung von Lernstrategien im Studium" (LIST). For the purpose of this study, the Croatian adaptation of this inventory was used (Sorić & Palekčić, 2002).

The questionnaire consisted of cognitive, metacognitive and resource management scales. The Croatian version of the LIST scale consisted of six cognitive strategy subscales, a metacognitive strategies subscale and seven resource management subscales (see Table 1 for sample items). Students were requested to indicate (on 5-point Likert scales from 1-*hardly at all* to 5-*very often*) to what extent they generally use the learning strategies included in the questionnaire. To obtain scores on these learning strategies subscales, ratings were averaged for all items on each subscale. Despite significant, but moderate correlations between specific learning strategies (see Apendix A), all of them were taken into consideration for further statistical analysis due to the presumption that reduction (according to the results of the higher order factor analysis[1]) could result in a loss of important findings about the relationships between examined variables.

In this study, for all subscales, one-factor structure was confirmed (by exploratory factor analyses and Guttman-Kaiserov criterion of extraction) and acceptable Cronbach's alpha reliability coefficients were revealed (see Table 1).

Table 1

Structure of Croatian version of LIST-scale and Cronbach alpha coefficients for each subscale on present sample (N= 176)

Croatian version of LIST scale – some characteristics			
Subscale	Typical item	Number items	Cronbach alpha
Cognitive strategies			
Elaboration (forming relations)	I try to relate new terms and theories to those I already know	7	.74
Elaboration (critical thinking)	I ask myself if the theories, interpretations or conclusions depicted are really convincing	12	.88
Organization – selecting main ideas	I ask myself to test whether I understand study materials	6	.73
Organization- structuring materials	I make tables and figures to be able to look at the information in a more structured way	5	.75
Rehearsal strategies	Study materials I try to learn by repeating	4	.60
Rote learning	I use rote learning for memorizing terms, rules, or concepts	5	.79
Metacognitive strategies			
	I ask myself to test whether I understand study materials	14	.79
Internal resource management strategies			
Effort regulation	If it is necessary I learn in the late evening and during the weekends	5	.62
Concentration problems	My concentration doesn't last long	6	.88
Time organization	It doesn't take to much time for me to start learning	4	.82
Time planning	I learn according to specific time plan	6	.78
External resource management strategies			
Study environment	I always learn on the same place	6	.77
Peer learning	I work on the study tasks together with my colleagues	8	.92
Literature	Information that I missed, I try to find in the different sources (notes, books, journals)	4	.73

Despite a slightly lower reliability coefficient for the Rehearsal strategies subscale and Effort regulation subscale (reliability coefficients of .60 were used as an acceptable level of internal consistency) it was concluded that these subscales were reliable enough, although only for research purpose of this study.

Causal attributions. The Causal Attribution Scale II (CAS-II) (Sorić, 2002) was administered to assess the causal attributions by which students interpret their academic achievement. Students were asked to indicate the most important reason for their achievement in

the last exam, and then to rate that particular reason along the causal dimensions of locus (internal or external), stability (stable or unstable), controllability (controllable or uncontrollable) and globality (global or specific). Consequently, the problem of numerous possible specific causes and different subjective interpretations of location of specific cause, along the causal dimensions between subjects and experimenter, was avoided. Each causal dimension was measured by four items subscale (e.g., "*I can control this cause.", "This cause influences all my academic achievements"*). Ratings on a 5-point scale (from 1- *not at all* to 5- *completely*) reflect the extent to which the subjects believed the cause exhibited these dimensional properties. One-factor structure for all four subscales was confirmed (by exploratory factor analyses and Guttman-Kaiserov's criterion of extraction) and Cronbach's alpha reliability coefficients for these subscales were: locus .87, stability .75, control .82 and globality .82.

Results

Correlations between different variables obtained in the present study are presented in Appendix A. The missing data was treated by the listwise deletion method. The domain specific interest was significantly correlated with reported use of learning strategies. Pearson's correlation coefficients that were obtained between almost all particular learning strategies and students' interests were significant, ranging from 0.15 to 0.37. However, as mentioned earlier, Pintrich and Schunk (1996) pointed out that future research should address the issue of how interest influences learning (not whether it has an effect on it). Accordingly, the next step for further analysis was to examine which of the used learning strategies was the best predictor of academic achievement. The stepwise regression analysis (backward method) was carried out with academic achievement as the criterion (operationalized as a grade on last exam).

Table 2

Summary of regression analysis with academic achievement as criterion (last step backwards)

Criterion	Predictors	*Beta*	*t*	*p*
Academic achievement	Organization – structuring materials	.23	3.09	.002
	Rote learning	-.15	2.00	.047
	Time planning	.22	2.96	.003
	R=0.34, R^2=0.12, F(3,172)=7.64, p<0.000.			

The multiple regression analysis revealed that organisation strategy (structuring materials), time planning and rote learning (as a negative predictor) were the best predictors of academic grades. These three predictors explain 12% of academic achievement.

Krapp (1999) noted that only a few studies have attempted to explore the effects of individual or situational interest by analyzing the relationship between interest and possible mediator variables, such as attention, learning strategies, flow, and feeling-related states. Hence the present study attempts to determine the potential mediating role of learning strategies in this relationship.

Procedure of mediation analyses and its limitations

Baron and Kenny (1986) postulate that a variable functions as a mediator when it meets three conditions: first, variations in levels of the independent variable significantly account for variations in the proposed mediator variable; second, variations in the mediator variable significantly account for variations in the dependent variable; and third, when first and second paths are controlled, a previous significant relation between the independent and dependent variables is no longer significant, and if this path is zero, then it is the strongest evidence of mediation. In statistical testing, the authors recommended four steps: first, the independent

variable must affect the mediator in the first regression equation; second, the independent variable must be shown to affect the dependent variable in the second equation; and third, the mediator must affect the dependent variable in the third equation. Mediation is demonstrated if, after controlling for the effects of the mediator variable on the dependent variable, the relationship between the independent variable and the dependent variable is significantly reduced. That is, as Baron and Kenny (1986, p. 1177) stated "perfect mediation holds if the independent variable has no effect when the mediator is controlled." Notwithstanding, Kenny (2008) warned against the negative side of mediation analysis practice, which seems to imply that if series of regression equations are estimated, the researcher has a definitive answer about mediation. "What is often ignored in mediational analysis is that there is a causal or structural model and the parameters of that model estimate the mediation... Unfortunately, most published mediational analyses do not explicitly acknowledge these assumptions. If the mediational model is wrong (i.e., misspecified) the results from a mediational analysis are not so much meaningless, but rather they are misleading." (Kenny, 2008, p. 355). Barron and Kenny (1986) in their original paper explicitly state the causal assumptions that underlie a mediational analysis. Similarly, Kenny, Korchmaros, and Bolger (2003) emphasised that a mediational model is a causal model, "ideally the variable *X* is a manipulated variable, and, consequently, if there is a statistical association, than *X* causes *M* and *Y*, and not vice versa" (Kenny et al., 2003, p. 126). Nevertheless, Kenny (2008) also states that the requirement of manipulation excludes the study of many variables where manipulation is either not ethically or practically possible (mediators are often internal, psychological variables that can only be measured and not manipulated). Therefore, he articulates his disagreement with the presumption that randomized experiments are the only legitimate method of mediational analysis and declares that no research design is perfect. Furthermore, Kenny, Korchmaros, and Bolger (2003) stressed that a statistical mediational analysis never establishes or proves mediation. Mediation occurs when a presumed causal variable causes the presumed mediator variable, which causes an outcome. Therefore, causation is a logical, theoretical and experimental issue and statistical analysis by itself cannot establish causation and, as a result, cannot establish mediation. Kenny, Korchmaros, and Bolger (2003) noted that a mediational analysis can prove that the model is false; however, it can not prove that is true.

A number of the above noted apprehensions are relevant to this study. Firstly, the proposed conceptual model of self-regulated learning is a cyclic model, thus the best methodological design for testing multiple stages and proposed causal relationships in a model is the longitudinal design. In our study, all of the questionnaires were applied only at one point in time (but subjects were instructed to answer the questions concerning the different time points). The longitudinal design should inquire about measurement of interests, learning strategies, academic achievement and causal attributions in different time points (through the whole academic year). Practically, longitudinal designs require much more time, effort and financial support, and because of this, in spite of its methodological strength, longitudinal studies are so rare. Inasmuch as causal arguments are based more strongly on methodological design, this problem (non-longitudinal data) limits the statistical conclusion validity of the data of this study. Another methodological constraint concerns regression analyses that test various parts of the conceptual model (see Figure 1), which could not show all of the predicted relationships among the variables (i.e., null effects that are predicted by the model). For the purpose of this study an attempt is made to test multiple parts of the conceptual model in two logical steps. Since self-regulated learning is considered a circular process, theoretically, each variable could be considered a predictor and as well as an outcome. In this study, students' interests and academic achievement were considered as a predictor and an outcome, and vice versa. First, it was logically presumed that students' interest could affect their academic achievement, and that this relationship could be mediated by learning strategies. Second, it was presumed that attained academic achievement could affect students' interests, and that this relationship could be mediated by the causal attribution which they made for that achievement. Due to the impossibility of testing the complete conceptual model as mentioned above, it is understood that the results of these analyses are only an indicator of possible

causal relationships. In addition to the limitation of applied analyses, additional issues need to be taken into consideration as well. In their original paper, Barron and Kenny (1986) discussed the "second source" of bias in the mediational chain: feedback. They concluded: "The use of multiple regression analysis presumes that the mediator is not caused by the dependent variable. It may be possible that we mistaken about which variable is the mediator and which is the dependent variable" (Barron & Kenny, 1986, p. 1177). In this study, two mediational analyses were designed: in the first analysis, it was proposed that learning strategies are mediator variables, and that academic achievement is the dependent variable, that is, learning strategies could not be caused by academic achievement (only this achievement might probably influence the choice of learning strategies in future learning tasks, after the reflection phase of the self-regulation learning process). In the second analysis, controllability is the mediator variable and interest is the dependent variable (causal dimension of controllability could not be caused by interest – a logical explanation for this kind of relationship could not be found). In this manner, it could be concluded that feedback bias is not present in the mediational analysis of this study.

Due to all of the mentioned methodological and statistical constraints, it is recognised that the results of these analyses are only an indicator for possible causal relationships that in future research needs to be tested with other methodology (e.g., longitudinal study design), and with more complex, powerful statistical analyses such as structural equation modeling. The theoretical potential of such indicators could be considered in light of Kenny's (2008) statement that the study of many psychological process variables would not be possible if it were accepted that randomized experiments are the only legitimate tool for meditational testing. In a similar manner, Hatano and Miyake (1991) note "Even in purely experimental research, the observable behavioural changes are invariably mediated by artifacts (e.g., the experimental equipment in a laboratory)" (Hatano & Miyake, 1991, pp. 273-274). Grinder (1989) states that retreat to the laboratory and distance from classrooms are difficulties in the field, that is, withdrawal from education-based problems. Similarly, Weiner (2007) concludes that attribution theories of motivation are occasionally criticized for restricting themselves to data from thought experiments instead of real event data. Furthermore, Berliner (1992) states that, in addition to understanding, predicting and control; the goal of educational psychology is to influence educational practice. Hence, research that focuses on real teachers and students in ordinary school (real-world) settings are required. Due to a large number of interrelated variables that can influence the results, designing research studies in education is much more difficult than in the other (physical) sciences. Since there are always numerous variables in authentic educational situations which might account for an effect, establishing cause-and-effect relationships can be very difficult. Recognizing the difficulty of conducting experimental laboratory research on the complex cognitive processes, and understanding that this kind of research often does not contribute to educational improvement, necessitate an emphasis on research in real, natural educational contexts, rather than laboratory settings (O'Donnell, 2004). The present study (research in natural educational context) complies with this necessity and may have a theoretical impact in verifying the proposed relationship between variables of the self-regulated learning model, in addition to a practical impact, including the improvement of education.

As mentioned above, the first series of regression analyses tested whether the effect of interest on academic achievement is mediated by the use of learning strategies (this proposed relationship could be drawn from the cyclical nature of Zimmerman's three phase model of self-regulated learning). Specifically, the following was tested: firstly, whether interest significantly affects learning strategies; secondly, whether interest significantly affects academic achievement; thirdly, whether learning strategies have a significant effect on academic achievement; and fourthly, whether, after controlling the effects of learning strategies on academic achievement, the relationship between interest and academic achievement is significantly reduced. This mediation analysis was applied to only three learning strategies which have been shown as significant predictors of academic achievement: organization-structuring materials, rote learning and time planning (see Table 3 and Figure 2.).

Table 3

Steps according the Baron and Kenny procedure of testing mediation: Whether the effect of interest on academic achievement is mediated by the use of learning strategies

Criterions	Predictor	*Beta*	*t*	*p*
First step: Regression of learning strategies on interest[2]				
Organization – structuring materials	Interest R=0.22, R^2=0.05, F(1,174)=9.07, p<0.003	.22	3.01	.003
Rote learning	Interest R=0.15, R^2=0.02, F(1,174)=3.76, p<0.054	-.15	-1.94	.054
Time planning	Interest R=0.25, R^2=0.07, F(1,174)=12.01, p<0.001	.25	3.47	.001
Second step: Regression of academic achievement on interest				
Academic achievement	Interest R=0.23, R^2=0.05, F(1,174)=10.03, p<0.002	.23	3.17	0.002
Third step: Regression of academic achievement on learning strategies (Details are shown in Table 1) R=0.34, R^2=0.12, F(3,172)=7.64, p<0.000				

Criterion	Predictors	*R*	R^2	R^2-*change*	*F*	*p*
Fourth step: Hierarhical regression of academic achievement on interest after controlling for the effects of the learning strategies						
Academic achievement	Step 1 (Learning strategies)	0.34	0.12			
	Step 2 (Interest)	0.36	0.13	0.01	2.60	0.11

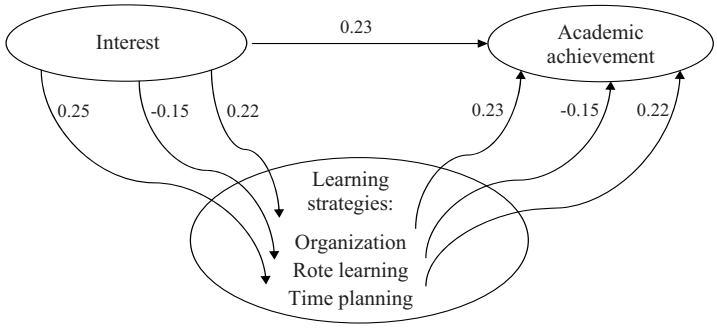

Figure 2. Diagram of mediation of learning strategies in the relationship between students' interest and their academic achievement.

As shown in Table 3, interest significantly affects learning strategies (first step), interest significantly affects academic achievement in the absence of learning strategies (second step), learning strategies have a significant unique effect on academic achievement (third step – see Table 2), and, finally, the effect of interest on academic achievement is reduced with the addition of the mediator, learning strategies, to the model. That is, interest has no significant effect when the mediator is controlled. Accordingly, this analysis shows that particular learning strategies could function as a mediator between students' interest and academic achievement.

As has already been stated, the causal relation between academic interest and achievement could run in the opposite direction – achievement could affect interests (Köller et al., 2000a,b). In the cycle dynamics of self-regulated learning, it seems logical to propose that the effect of attained academic achievement on subsequent interest in learning subject could be mediated by causal attributions for that achievement. Taking this issue into consideration, the next step of the study was to test whether causal attributions mediate the relationship between learning achievement and interest. The mediation analysis of this study was guided by Baron and Kenny's (1986) procedure, once again, and results of this analysis are shown in Table 4, Figure 3. Complete analysis was obtained only for causal dimension of controllability, as a result of the fact that the other dimensions failed to meet the three necessary conditions for mediation.

Table 4

Steps according to the Baron and Kenny procedure of testing mediation: Whether causal attributions of controllability mediate the relationship between academic achievement and interest

Criterions	Predictor	Beta	t	p
	First step: Regression of controllability on academic achievement			
Controllability	Academic Achievement R=0.31, R^2=0.10, F(1,174)=18.99, p<0.001	.31	4.36	.000
	Second step: Regression of interest on academic achievement			
Interest	Academic Achievement R=0.23, R^2=0.05, F(1,174)=10.03, p<0.002	.23	3.17	0.002
	Third Step: Regression of interest on controllability			
Interest	Controllability R=0.22, R^2=0.05, F(1,174)=8.71, p<0.004	.22	2.95	0.000

Criterion	Predictors	R	R^2	R^2-change	F	p
	Fourth step: Hierarhical regression of interest on academic achievement after controlling for the effects of tcontrollability					
Interest	Step 1 (Controllability)	0.22	0.05			
	Step 2 (Academic achievement)	0.27	0.08	0.03	5.66	0.02

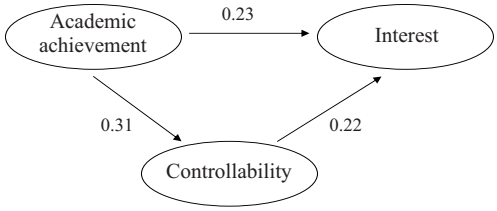

Figure 3. Diagram of partial mediation of causal dimension of controllability in the relationship between students' academic achievement and their interest.

Note. Sobel Test Statistic: 3.56 (p<0.001).

Performed analysis showed: first, academic achievement affected the proposed mediator variable – causal dimension of controllability. Second, academic achievement affected interest. Third, the proposed mediator variable, that is, the causal dimension of controllability, affected interest. Finally, after controlling for the effects of the mediator variable (controllability dimension) on interest, the relationship between academic achievement and interest was significantly reduced (the effect of academic achievement on interest was less in the fourth equation than in the second equation). According to Baron and Kenny (1986), if the correlation between the independent variable and the dependent variable has been reduced to a non-significant level then full-mediation has been identified. If this association is still significant, partial mediation has been identified – therefore the second analysis (Table 4) shows a case of partial mediation. The result of the Sobel test (3.56; p<0.001) confirm that, in this case, significant partial mediation has occurred. Therefore, it may be cautiously concluded, due to all the methodological constrains mentioned earlier, that the controllability dimension of causal attributions could play a partial mediating role in the relationship between the students' academic achievement and their personal interests in the field of study.

Discussion

Students who attained better academic achievement reported a higher level of use of certain learning strategies, that is, almost half the examined strategies, but not all of them. Therefore, the

presumption that higher achievers tend to report a greater use of most learning strategies (cognitive, metacognitive and resource management) than lower achievers, is not proved by the results of this study. In order to clarify this finding, an attempt was made to verify which of the examined learning strategies predict students' academic achievement. Only three of the learning strategies were shown to be significant predictors of students' academic achievement: organization-structuring materials, time planning, and rote learning. Organization-structuring materials theoretically belong to cognitive strategies, and together with organization-selecting main ideas, elaboration-forming relations and elaboration-critical thinking, represent deep-processing learning strategies. Although rote learning and rehearsal strategies are cognitive strategies as well, nevertheless, they are surface-processing learning strategies. Students, who rely on deep-level processing strategies, analyse the subject-matter from different angles and establish diverse relations. With regard to these relations, they organise and structure learning materials in a particular subjective arrangement, which facilitates the process of knowledge acquisition. By definition, organisation strategies are aspects of the deep processing approach, hence, it is not surprising that students' use of these kinds of learning strategies lead to better academic performance. It seems that successful students must engage in strategies aimed to organise learning materials in their own way which, in turn, enables them to build the best possible connections between prior knowledge and new knowledge. These students also reported more use of graphic techniques (diagrams, schemas, summaries) as aids in the organization of subject material, thus making learning easier. Weinstein, Husman, and Dierking (2000) note that organisational strategies are used to construct internal connections among pieces of information given in the learning material, in addition, these strategies include sorting or clustering the related information, outlining or diagramming the information and creating spatial relationships. Likewise, the findings in this study emphasise the importance of subjective organisation of learning materials for a successful learning process. In the field of cognitive psychology, many authors stress that organisation of newly learned information, which includes encoding relations among new and prior knowledge, benefits both learning and remembering. The power of subjective organisation is apparent in the storage phase, as well as, in the retrieval processes (Kellog, 1995; Medin & Ross, 1996).

A negative predictor of academic achievement was the strategy of rote learning. This strategy represents the process of student learning that includes repeating learning material until it is remembered, however, without understanding the meaning of it. The ineffectiveness of this surface-level processing strategy is obvious and confirms the benefit of deep-level processing strategies once again.

The time planning strategy (internal resource management strategy) was shown to be a significant predictor of academic achievement, also, which is not surprisingly considering the nature of the Croatian higher education system. This system is characterised by a compulsory curricula of classes that are taken in a fixed order. At the end of the academic year, students are required to pass all compulsory exams in a relatively short three month period (which includes two exam periods of three weeks at the beginning, and at the end, of this period). Therefore, good scheduling and systematic preparation for each exam are of essential significance for academic success.

It seems that the learning strategy of organisation (structuring materials), and time planning, are most instrumental for academic performance, that is, for success on specific exams. In general, learning strategies were not strongly related to learning performance (they accounted for 12% variance in achievement). Schiefele, Wild, and Krapp (1995) found similar correlations value and proposed two possible reasons for the relatively weak strategy-achievement relation. First, it is possible that the usual assessment of achievement (grading system) does not reflect deeper forms of learning that are based on intensive use of learning strategies. It is possible that other indicators of students' learning performance would be better, for example, quality of knowledge, transferability of knowledge and so on. Pintrich (2003) distinguished four general learning outcomes: the direction of behaviour (choice of one activity over another); the intensity of behaviour (level of activity or cognitive involvement in task); persistence and actual achievement or performance (course) grades. He cautioned that educational researchers must take

into consideration the fact that different motivational components could facilitate or constrain different learning outcomes. Second, self-reports of past strategy use have some methodological constraints (e.g., calibration), and it is necessary to include other methods for measuring learning strategies in the future research (e.g., observations in natural settings, tracing methodology). The question that still remains is: why is it that only these three specific strategies have been revealed as significant predictors of academic achievement? It could be proposed that these specific strategies best represent the different categories of learning strategies, including deep-level cognitive strategies (organization-structuring materials), surface-level cognitive strategies (rote learning) and resource management strategies (time planning). However, this proposition needs to be more precisely investigated in the future research.

Schiefele (1991), using both experimental and correlational designs, has shown that college students' personal interest is positively related to the use of deeper cognitive processing strategies such as elaboration, seeking information, and engagement in critical thinking. Furthermore, personal interest is negatively related to the use of the surface processing strategy of rote learning. Pintrich and DeGroot (1990) have shown that personal interests are positively correlated with deeper processing strategies such as the use of elaboration and organisational strategies, critical thinking, and time and effort regulation strategies, in both college and junior students. Schiefele et al. (1995) have found that interest is closely related to elaboration strategies, which are aspects of the deep processing approach. However, in their research only a subscale for metacognitive, and three subscales for cognitive strategies (forming relations, critical thinking and rehearsal) were applied. In this research (see Appendix A), Pearson correlation coefficients between almost all particular learning strategies and students' interests were significant, ranging from 0.15 to 0.39. In addition, detailed inspection of the correlation matrix has shown that one set of learning strategies seems related to interests, while another set is related to achievement. It is possible to interpret these findings in the light of previous research made by Harackiewicz, Barron, Taver, Carter, and Elliot (2000). They investigated relationships between two indicators of students' academic success (continued interest and performance – grade) and their achievement goals. Moreover, they tested whether students' study strategies mediated goal effects. The results revealed that performance goals had no effect on interest, but they were associated with subsequent grades. Conversely, mastery goals had positive effects on continued interest, nevertheless, mastery goals failed to predict performance. Furthermore, mastery goals predicted deep, elaborative processing, whereas performance goals predicted surface level processing. The study provided evidence that mastery and performance goals have positive and complementary consequences for motivation and performance in college courses. The results of this study show similar patterns. On the whole, students, who adopted intrinsic interest-based motivation in learning, report more use of cognitive strategies, metacognitive and resource management strategies. Thus, the results indicate that interest-based motivation could have a favourable effect on the learning process. These findings confirm the important role of interest in selecting and using specific kinds of learning strategies, however, the question that still remains is the extent to which learning strategies mediate the relationship between interest and learning achievement. In the present study, the issue of whether the effect of interest on academic achievement is mediated by the use of learning strategies was tested by Baron and Kenny's procedure of mediation analysis. Hierarchical regression analyses reveal that interest has no significant effect on the academic achievement when the mediator, learning strategies, is controlled. Therefore, it seems that particular learning strategies can function as a mediator between students' interest and academic achievement. Overall, a few of the examined relations between interest, learning strategies and achievement were relatively weak. Nevertheless, these weak relations were not unexpected due to similar findings that were found in other studies (Schiefele et al., 1995). Some possible reasons were mentioned earlier (disadvantages of self-report measure of past strategy use (calibration problem), academic achievement measure which doesn't reflect deeper forms of learning), nonetheless, in this study one possible reason that is proposed is the nature of used instruments. Applied instruments measured general learning strategies, while the measure of academic achievement was grade performed on the specific subject exam. It is possible that the examined relations would be stronger if specific learning

strategies that students used when preparing for that particular exam were assessed. All in all, it could be concluded, with a note of caution, that the presumption that learning strategies could be a potential mediator in the relationship between students' interests and their academic achievement has been proven to be acceptable.

Accordingly, these findings fit into Zimmerman's cyclical model of self-regulated learning, which emphasises complex bi-directional relations between all constructs and processes. Consequently, selection and use of different learning strategies in the action control phase could be affected by students' interests (the forethought phase), and may mediate the effect of these interests on students' academic achievement (the self-reflective phase) as well.

Taking Zimmerman's model into consideration, Schunk (2001) emphasises that various self-regulatory processes come into play during the different phases of self-regulated learning. Through the processes of the self-reflective phase, students evaluate their performance and make causal attributions for performance. When an outcome occurs, expectancy of future success following an outcome, and emotional and behavioural consequences of this outcome, are influenced by the causal attributions made for this outcome, that is, by perceived causal dimensions of the cause of the achievement (Weiner, 1996). Self-regulated learners are more likely to understand poor performance as being due to the implementation of ineffective learning strategies (internal, unstable, controllable causes). The aforementioned types of causal attributions are recognized as being highly effective in sustaining motivation to learn. These kinds of attributions could be perceived as correctable and could protect learners against negative self-reactions, especially in the case of failure. Alternatively, if the academic failure is attributed to internal, uncontrollable and stable causes, which could be perceived as fixed (such as lack of ability), the self-reactions would likely be negative. As a result of negative self-reactions such as decreased feelings of self-competence, students' interest in the topic could decrease and, consequently, students could direct their interest to other topics in which they perceive themselves to be capable. In this context, it seems reasonable to propose that the effect of attained academic achievement on subsequent interest in learning subject could be mediated by causal attributions for that achievement. In the present study, this aspect of the cyclical nature of the self-regulated learning process was also investigated. Obtained results support the predicted mediating role of causal attribution, but only for the causal dimension of controllability. Hence, it may be concluded that the causal dimension of controllability could play a partial mediating role between students' academic achievement and their interests. Students with deeper study interests perceived the cause of their academic achievement as more controllable. This finding could have interesting implications for the design of motivation interventions. Most people have an "ability-as-capacity" belief, which represents ability as a stable, unchanging and uncontrollable aptitude of the individual, and results in the dimension classification of ability as an internal, stable and uncontrollable cause. This bias in the perception of ability has an important implication, that is, if ability is stable, unchanging then it is not able to improve with time (Dweck, 1999). This kind of attribution has harmful consequences on learning motivation. An "ability-as-capacity" belief suggests that the exertion of effort will help improve performance up to a certain point, but effort will not help beyond that point because ability has set an upper limit on performance. Therefore, the exertion of effort is ineffective. A student that views success or failure as stable and uncontrollable might have no reason to exert effort to repeat/attain success. If attribution is not stable (effort *vs.* ability), but rather changeable, then performance could be improved with time. Interpretation of cause of failure as unstable, controllable and internal is conceptually equivalent to an attribution of a lack of effort or an ineffective learning strategy. As a result, students that make these patterns of attributions, expect to get better with time (unstable) and feel that the causes of their achievement are inside of them (internal), furthermore, that they could control them (controllable). In this way, they can still expect to succeed in the future, that is, effort exertion (such as changing learning strategy) could be effective. Therefore, motivational problems in the learning process, such as passivity, and apathy, that are connected with the students' attribution of their failure to internal, stable and uncontrollable causes, could be avoided. The results of this study could be interpreted in a similar way, but only for the causal dimension of controllability. Students, who attribute their

achievement to controllable causes, report more interest in the subject they study. Therefore, this group of students would probably increase their subsequent motivation to learn because their interpretations of attained achievement in terms of controllable causes would raise their feeling of competence and would, consequently, have a positive effect on their future interest in studying. In contrast, students who attribute their achievement to uncontrollable causes, such as bad/good luck or teacher's bias, would probably conclude that the exertion of effort is ineffective because they are unable to control the cause of their academic achievement and, as a result, they would reduce their future attempts to learn. In this way, their feeling of self-competence would be threatened and, accordingly, their interest in that learning topic would probably decrease. This would lead them to direct their interest to other topics in which they perceive themselves to be more competent.

A possible (hypothetical) interpretation of the entire dynamics of the learning process would be as follows: students' use of particular cognitive and resource management learning strategies contribute to the development of their interests and mediate the effect of these interests on students' academic achievement. Furthermore, the causal attributions of acquired achievement, particularly the dimension of causal controllability, have a partial mediating role between the students' academic achievement and their subsequent interests in the topics of their study. In future research this possible interpretation should be more precisely tested with other methodology (such as measures in time series). The practical implications of these findings could be as follows: students could be directed to use more effective learning strategies which would increase their interests in topics of their studies and, thereby, their academic achievement. In addition, the causal attributions of these students could be influenced by directing them toward controllable causal attributions for their performance, such as learning strategies that have been used. In this manner, their interests could be enhanced. From this point of view, this pattern of causal attributions is the most effective for improving the motivation to learn and for enhancing students' prospective interest in the topic of their study.

Generally speaking, the findings of this study imply a dynamic and cyclical nature of the learning process. Interest is an integral part of this process and can be conceptualized as both a consequence, and an antecedent, of cognitive aspects of learning. Recently, other research has indicated that interest could be a mediator of associated self-regulatory processes, such as self-efficacy and achievement goal orientations (Hidi, 2006). Krapp (2002) pointed out that an important line of research in this field is concerned with the search for mediating variables that can explain the positive effects of interest-based learning at the level of functional processes. Among the variables that have been analyzed several times Krapp includes attention, learning strategies and emotional experiences. As findings of this research indicate, it seems reasonable to include causal attributions as potential mediator variables and, furthermore, to investigate this mediation relationship in more detail in future research, also. The results of this and similar research could contribute to the understanding of the complex dynamics of the learning process, and could provide practical guidelines for the improvement of student's motivation to learn as well.

Finally, it is important to reiterate several constraints of this study. First, in future research other indicators of students' learning performance (e.g., quality of knowledge, transferability of knowledge etc.) could be a better criterion of students' academic achievement. Second, self-reports of past learning strategy use have certain methodological constraints, therefore, it is necessary to include other methods for the measurement of learning strategies in future research, for example, observations in natural settings. Third, in the present research instruments were applied that reveal general learning strategies, while other measures were more specific, including measure of domain-specific interests, measure of academic achievement as grade performed on the specific subject exam and measure of causal attributions for that specific achievement. In future research it would be interesting to test whether the examined relations would be stronger if specific subject learning strategies were assessed. Fourth, proposed causal relationships have to be verified with methodology (i.e., experimental procedures, quasi-experiments, longitudinal study design) and analysis procedure (i.e., structural modeling) that produce much stronger data with regard to causal explanation rather than purely correlational data.

Appendix

Correlations and descriptive statistics of the variables included in the study

Variable	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	*M*	*SD*
1. Interests	1,00																			2,99	0,30
2. Achievement	**0,23**	1,00																		3,30	1,06
3. Internality	**0,17**	**0,35**	1,00																	3,65	1,15
4. Stability	-0,05	**0,32**	**0,28**	1,00																3,25	0,91
5. Gobality	0,13	**0,49**	**0,56**	**0,67**	1,00															3,01	1,07
6. Controllability	**0,22**	**0,31**	**0,82**	0,13	**0,43**	1,00														3,54	1,12
7. Organization – selecting main ideas	0,13	0,14	0,04	-0,01	0,01	-0,01	1,00													3,26	0,74
8. Organization – structuring	**0,22**	**0,25**	0,11	0,09	0,02	0,13	**0,58**	1,00												4,15	0,60
9. Elaboration – forming relations	**0,34**	0,08	0,08	0,02	0,03	0,05	**0,38**	**0,43**	1,00											3,76	0,64
10. Elaboration – critical thinking	**0,31**	0,06	0,14	-0,01	0,09	0,08	**0,36**	**0,32**	**0,64**	1,00										3,22	0,65
11. Rote learning	**-0,15**	-0,08	-0,07	-0,04	-0,06	-0,05	**0,26**	0,13	-0,08	0,01	1,00									2,93	0,87
12. Rehearsal strategies	**0,18**	**0,20**	0,08	0,09	0,06	0,09	**0,40**	**0,45**	**0,26**	**0,16**	**0,22**	1,00								4,03	0,60
13. Metacognitive strategies	**0,34**	**0,17**	**0,18**	0,09	0,10	**0,20**	**0,52**	**0,57**	**0,49**	**0,56**	**0,29**	**0,45**	1,00							3,61	0,50
14. Effort regulation	**0,30**	**0,25**	0,08	0,07	0,08	0,07	**0,38**	**0,41**	**0,35**	**0,25**	**0,25**	**0,51**	**0,47**	1,00						3,86	0,57
15. Concentration problems	**-0,37**	**-0,15**	-0,11	0,01	-0,00	-0,14	-0,11	**-0,21**	**-0,20**	**-0,18**	0,13	**-0,25**	**-0,19**	**-0,28**	1,00					3,07	0,72
16. Time organization	0,10	**0,19**	0,02	0,08	0,01	0,12	**0,16**	**0,33**	0,08	0,08	**0,26**	**0,36**	**0,39**	**0,42**	**-0,20**	1,00				3,26	0,91
17. Time planning	**0,25**	**0,23**	0,07	**0,20**	**0,24**	0,07	**0,21**	**0,18**	**0,15**	**0,18**	**0,19**	**0,32**	**0,32**	**0,42**	**-0,34**	**0,45**	1,00			3,01	0,71
18. Study environment	**0,15**	**0,17**	-0,03	0,09	-0,03	-0,01	**0,32**	**0,40**	**0,27**	**0,19**	**0,16**	**0,49**	**0,43**	**0,53**	**-0,25**	**0,59**	**0,36**	1,00		3,82	0,67
19. Peer learning	**0,35**	0,14	0,03	0,09	0,05	0,13	**0,34**	**0,34**	**0,37**	**0,31**	0,06	**0,42**	**0,47**	**0,49**	**-0,19**	**0,34**	**0,32**	**0,48**	1,00	3,45	0,88
20. Literatura	**0,32**	0,09	0,09	-0,02	0,01	0,12	**0,37**	**0,35**	**0,41**	**0,46**	0,07	**0,34**	**0,48**	**0,39**	**-0,15**	0,04	**0,16**	**0,35**	**0,46**	3,78	0,70

Note. Marked correlations are significant at $p<0.05$.

Notes

1 The higher order factor analysis on learning strategies has revealed only two factors which were very difficult for meaningful interpretation.

2 The multivariate regression analysis was performed and the Wilks's lambda was significant [$F(3,171)=8.75$; $p<0.001$].

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Ce travail de recherche se propose comme but d'examiner le rapport entre l'intérêt manifesté par l'étudiant, les stratégies d'apprentissage mises en oeuvre et le principe de causalité d'attributions justifiant selon lui son parcours universitaires. Nos recherches ont porté sur le rapport entre quelques variables d'importance relatives aux trois étapes de l'apprentissage auto-régulé, en l'occurence l'étape de réflexion préliminaire (intérêt), l'étape de mise en oeuvre (stratégie de l'apprentissage) et l'étape de la réflexion proprement dite (causalité d'attributions).

Les résultats de nos recherches confirment le fait que les stratégies d'apprentissage peuvent jouer un rôle de médiateur quant au rapport entre l'intérêt manifesté par l'étudiant et le diplôme obtenu. Par ailleurs, les résultats de nos recherches montrent que la dimension causale de la contrôlabilité peut jouer en partie un rôle de médiateur au niveau du rapport entre le diplôme universitaire acquis et l'intérêt manifesté. D'une manière générale, les résultats que nous avons obtenus révèlent le caractère dynamique et cyclique du processus d'apprentissage – l'intérêt de l'étudiant étant partie intégrante du dit processus et pouvant être envisagé à la fois comme ayant précédé ou suivi l'aspect cognitif de l'apprentissage.

Key words: Causal attributions, Interests, Learning strategies, Self-regulated learning.

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Current theme of research:

The process of self-regulated learning: Intrapersonal and interpersonal predictors of students' and teachers' emotional experiences during different phases of self-regulated learning. How students regulate their emotions and how this way of emotional regulation contributes to their academic achievement.

Most relevant publications in the field of Psychology of Education:

Rokach, A., Orzeck, T., Lacković-Grgin, K., Penezić, Z., & Sorić, I. (2002). The Effects of Culture on Coping With Loneliness. *Psychology and Education: An Interdisciplinary Journal, 39*(3/4), 1-11.

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Current theme of research:

Motivation and interest in higher education: An intercultural approach.

Most relevant publications in the field of Psychology of Education:

Müller, F.H., & Palekčić, M. (2005). Bedingungen und auswirkungen selbstbestimmt motivierten Lernens bei kroatischen Hochschulstudenten. *Empirische Pädagogik*, *19*(2), 134-165.

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