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Effects of a Teacher-Training Program for Developing Critical-Thinking Skills in University Students of Southeast Mexico

Efectos de un programa de capacitación de profesores en el desarrollo de habilidades de pensamiento crítico en estudiantes universitarios en el Sureste de México

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Abstract

The purpose of the present study was to obtain evidence about the effect of a teacher-training program at an institution of higher education in southeastern Mexico: the University of Mayab (Unimayab). The experimental group was composed of the students of nine teachers who, during the spring semester of 2003, took a course at the Unimayab (n = 219). Nine others were invited to participate as a control group of (n = 218). At the beginning and end of the semester, participants completed the California Critical Thinking Skills Test (CCTST). The results show significant differences in the dimensions measured by this test, except for the capability for analysis. Observations of teaching practice also showed better strategies for teachers who had taken the training program. It is concluded that teacher-training can improve the development of critical-thinking skills in students. Discussed are limitations of the study, as well as the implications for teacher-training at the university undergraduate level.

Keywords: Critical thinking, in-service teacher training, teaching methods, higher education.

Resumen

El presente estudio tuvo como propósito obtener evidencia acerca del efecto de un programa de capacitación para profesores de una institución de educación superior del sureste de México: la Universidad del Mayab (Unimayab). El grupo experimental se conformó con los estudiantes de nueve profesores que durante el semestre primavera de 2003, dieron algún curso en la Unimayab (n = 219). Se invitaron a otros nueve grupos paralelos a participar como grupo de control (n = 218). Al principio y al fin del semestre los participantes contestaron la prueba California Critical Thinking Skills Test (CCTST). Los resultados muestran diferencias significativos en las dimensiones que mide esta prueba, a excepción de la habilidad de análisis. Las observaciones de las prácticas docentes también mostraron mejores estrategias en los maestros que habían tomado el programa de capacitación. Se concluye que la capacitación docente puede mejorar el desarrollo de habilidades de pensamiento crítico en los estudiantes, y se discuten las limitaciones del estudio y las implicaciones para el entrenamiento de profesores a nivel licenciatura.

Palabras clave: Pensamiento crítico, formación de maestros en servicio, métodos de enseñanza, educación superior.

Introduction

The majority of educators, administrators, policy-makers, and business people recognize that the goals of education should go beyond the perspective of the traditional transmission of knowledge. Every day, more institutions are concerned about their responsibility for training people in thinking skills such as creative thinking, decision-making, problem-solving, learning to learn and reasoning skills.

The academic department of the University of Mayab (Unimayab) in Mexico, has begun a training program to improve its faculty's teaching skills, assuming that these skills can help their students to achieve this goal if they design and use certain specific strategies.

As to the administrators of the University, they are aware of the need for their students to develop the academic and nonacademic skills necessary in a constantly-changing labor market. The first group of teachers completed their training program at the beginning of this year. It was of vital importance not only to gauge whether the faculty had improved their teaching strategies, but also to find out how this program had impacted the critical-thinking skills of these teachers' own students. Therefore, if the purpose of implementing this program was to improve higher-order thinking skills, it was of primary importance to find out to what extent this goal had been reached, and if adjustments needed to be made to reinforce it, to see what those adjustments were.

The evaluation of higher-education programs has taken on importance for estimating the effectiveness of the educational process, for example, in the ability of the undergraduate programs to develop critical-thinking skills.

The purpose of this study is to evaluate the effects of a teacher-training program in an institution of higher education in southeastern Mexico: Mayab University (Unimayab).

In September, 2001, the Unimayab began the program Specialization in Teacher Leadership (ELD),* in order to improve the teaching skills of its faculty. The program was designed to give teachers learning opportunities and teaching tools that would facilitate the development of their students' higher-order thinking skills, such as analysis, problem-solving, decision-making, among others, and to provide their students with opportunities to use critical thinking in their regular courses (*Manual de Filosofía Legionaria*, 2002). Since then, teachers have been encouraged and motivated to develop skills of expression and reasoning, and to this end, it was suggested to them that they develop specific strategies in their regular courses.

Teacher training in this institution is based on a constructivist view of learning (Marzano, 1992, 1999; Marzano and Pickering, 1997; Marzano, Pickering and McTighe, 1993). The ELD covers 11 presencial courses of between 30 and 48 hours, plus independent work of between 20 and 90 hours. The program is made up of 348 presencial hours and 542 hours of independent work.

* For ease of reference, where the names of organizations have been translated from the Spanish, their acronyms have been retained as given in that language. In the case of international organizations which have commonly-used acronyms in English, those acronyms have been used.

I. Theoretical framework

In recent years many studies have been done on the need for young people to learn to analyze information, solve problems and make decisions. However, only in the last 20 years have educators begun to address this topic in a serious manner. One of the goals of the National Education Panel of the United States (Halpern, 1996) was for college students to be able to think critically, communicate effectively and solve problems. Unfortunately, evidence has shown that this goal has not been reached.

According to Nickerson (1994), concern about the development of students' skills of higher-order thinking has increased among researchers and educators. Evidence has shown that students of all levels of the formal education system are unable, in great part, to do the kind of thinking that work in universities is requiring. Although there have been repeated efforts to train instructors in effective teaching strategies, which could have an effect on students' reasoning, research suggests that the goal of teaching students to think critically continues to be unattained (Lemming, 1998).

The poverty students have shown in critical thinking is not a matter of nationality. Many countries have recognized the need for people to be able to think critically. In the last competition of the Third International Mathematics and Science Study (TIMSS), the performance of Mexican students was very poor, and the scores they obtained placed them almost at the bottom of the list. Although these results stirred up much criticism, the fact is that our students had not developed thinking skills adequate for solving mathematical problems (Bracey, 2000). Moreover, the conclusion of the panel of higher-education experts who met in Mexico was that the work of universities is to produce students who can think when facing a world so full of change as the present one (Halpern, 1996). Therefore, education should provide students with certain tools, such as learning *how to learn*, and knowing how to analyze all the information that inundates us every day.

Although it seems obvious that institutions of higher education must provide students with learning experiences that would enable them to improve their thought processes, the challenge is not an easy one. To develop these skills, different approaches have been developed; some attempts have been made through programs of direct instruction (Bransford and Stain, 2000), and some people have suggested that teaching thinking skills within a specific domain of knowledge helps to develop levels of higher-order thinking in students (Hannel and Hannel, 1998, Mayer, 1998, Nickerson, 1994).

Brookfield (1987) has argued that critical-thinking skills are vital to becoming a fully-developed person. While many educators recognize the need to help their students develop these skills, many teachers feel they do not have enough time to devote to this goal; others have acknowledged their own inability to think critically, and therefore, do not feel prepared to meet this challenge. Furthermore, some

university teachers are not able to define what critical thinking means for themselves (Kronberg and Griffin, 2000).

In many cases, teachers recognize the importance of critical thinking, but they agree that they have no clear definition for it. Consequently, little has been done to incorporate methods of teaching critical thinking into the curriculum in higher education. The first step, then, is for teachers to have a better understanding of this construct.

Critical thinking has been frequently associated with the use of cognitive tools that allow an increase in the chances of achieving a desirable outcome. It has been described as a deliberate process of thinking, aimed at achieving a goal, such as the kind of thinking used in problem-solving, decision-making, analysis and logical inference. Somehow, all these definitions involve mental processes that are useful for a particular cognitive task, involve thought having direction, since it is focused on obtaining a desired result.

Cambers, Carter-Wells, Bagwell, Padget and Thomson (2000) treat the development of critical thinking as a process with two components: the student's need to develop cognitive skills of critical thinking, such as analysis, evaluation, inference, and self-regulation and the motivation of students to develop a critical disposition that involves being open to multiple approaches. They define critical thinking as a sophisticated process that includes skills, dispositions and metacognition.

Brookfield (1987) has identified four characteristics of critical thinkers: (a) they try to identify the assumptions underlying ideas, beliefs, values and actions; (b) they are aware of the context; (c) they have the ability to imagine and explore alternatives to existing ways of thinking and living; (d) they are usually skeptical of claims of universal truths or ultimate and final explanations. The suggestion is that the student be actively engaged in learning, rather than being a passive recipient of information, with the aim of becoming a critical person. The author argues that the ability to think critically is crucial to understanding our relationships, to imagining ways of organizing ourselves in our work in an alternative or more productive manner, and to becoming politically-educated people. This is one of the most important challenges facing higher education.

Moreover, Hannel and Hannel (1998) have suggested seven steps to follow in teaching critical thinking. His proposal is to divide the learning process into two parts: the creation of the main idea, and the actual process of the seven-step methodology. The main idea involves a general goal that sparks students' interest and leads them to get involved in the lesson that follows. The recommendation is that teachers move from the main idea—which could be related to real life, school or work—to the seven sequential cognitive areas, using systematic questions. These are: (a) look at the information, label it and identify facts; (b) compare, relate, make analogies; (c) classify, integrate, find relationships; (d) decode, deduce; (e) encode; (f) infer, project, apply; (g) summarize. These authors

maintain that one of the impediments that stand in the way of helping students become critical thinkers is the lack of practical strategies for instruction. They believe that teachers should move away from the style of direct instruction, and use questions in each lesson, so that students demonstrate their learning to the teacher in a questioning process that involves the seven steps outlined above.

Laskey and Gibson (1997) state that critical thinking is a complex process that refers to a repertoire of cognitive activities that act together, and that it includes cognitive skills such as problem-solving, logical thinking, perspective and perception concerning ideas; analysis, evaluation and decision-making. These authors support the idea that teachers should use leading questions, with the aim of developing critical thinking in their students. They suggest that teachers use different levels of questions in class:

a) Literal questions as reminders of basic information;
b) Questions of translation that make students express the information in a different way;
c) Questions of interpretation that would allow students to find relationships between facts, values, and generalizations;
d) Questions of application questions to transfer ideas and concepts to other materials;
e) Questions of analysis that would allow students to identify logical steps in the processes of thoughts, and how to reach conclusions;
f) Questions of synthesis that integrate all the information and use it to create a new idea.
g) Evaluation questions that would enable them to reach a value judgment.

This approach by Laskey and Gibson (1997) is based on Bloom's taxonomy (1990), and focuses on a series of orderly steps that guide the teacher in the development and promotion of critical thinking.

In a four-year study related to the disposition toward the critical thinking of undergraduate students, researchers Giancarlo and Facione (2001) developed the *California Critical Thinking Disposition Inventory* (CCTDI). Factor analysis of this study showed seven dispositions toward critical thinking: 1) search for truth, 2) open mind, 3) capacity for analysis, 4) systematic critical thinking, 5) security in reasoning, 6) curiosity, and 7) the maturity to make judgments. In fact, Facione (1998) has stated that critical thinking is a corner stone in the journey human kind is taking:"Critical thinking came before schooling was ever invented, it lies at the very roots of civilization" *[Free translation by the authors]** (p. 8).

* The words in parenthesis apply only to the Spanish version of this article. For this translation, we were able to obtain Dr. Facione's original English from his article published at http://www.insightassessment.com/pdf_files/What&Why2010.pdf.

In the study, Giancarlo and Facione (2001) also identified six core competencies for critical thinking: 1) analysis, 2) inference, 3) interpretation, 4) evaluation, 5) explanation, and 6) self-regulation, and reached the consensus that critical thinking is a deliberate and pervasive human phenomenon. These authors claim that people who think critically are not only characterized by cognitive skills, but also by the way they view life; such individuals can be recognized by how they tackle questions, issues or problems. This means that critical thinking goes beyond the classroom.

The authors of this study also investigated the question of whether the positive characteristics that distinguish a person with critical thinking improved or increased as a result of scholastic experiences in the university. They found that such characteristics as the search for truth, confidence in their reasoning, and total test scores increased and showed significant differences. They also observed that in the scales of open-mindedness and curiosity, scores were high. They found, as well, differences among the disciplines and genres (Giancarlo and Facione, 2001).

The findings of Giancarlo and Facione (2001) support the idea that it is essential to develop certain attitudes in order to think critically. Although some attitudes seem to be modified as a result of education and experience, teachers should intentionally develop and promote positive attitudes toward critical thinking.

Ennis (1993), who has been actively involved in the assessment of critical thinking, argues that critical thinking is a successful and reflective type of thinking focused on deciding what to think and do. To think critically, this author proposes that one carry out most of the following actions:

a) Judge the credibility of sources.
b) Identify the findings, reasons and assumptions.
c) Judge the quality of an argument, including the acceptability of its reasons, assumptions and evidence.
d) Develop an independent position on an issue.
e) Make appropriate clarifying questions.
f) Plan and design experiments.
g) Define terms in a manner appropriate for the context.
h) Have an open mind.
i) Try to be well informed.
j) Draw conclusions carefully, and draw them when we have the evidence on which to base them.

1.1. Critical Thinking

There is no consensus on the definition of *critical thinking*. In fact, the definitions have been constituted in accordance with philosophical, psychological and educational focuses. A teacher who uses a philosophical approach wants her* students to process the content of their subject matter critically and analytically, so that they can integrate it into their own thinking—rejecting, accepting or evaluating it (Ennis, 1993). In this approach, a person who thinks critically understands the structure of the argument regardless of whether the one who is arguing is a politician, a salesman or a friend. In this sense, a person who has developed a critical thought is someone who uses specific criteria to assess reasoning and decision-making. In other words, the person understands the issue, and evaluates the underlying arguments so as to draw conclusions (Distler, 1998).

According to Marzano, Brand, Hughes, Jones, Presseinsen, Ranking and Suhor (1988), there are five dimensions of thinking:

a) Metacognition, which involves being aware of what one thinks while performing specific tasks, and also, the use of this awareness in what one is doing. There are at least two processes involved in metacognition: the first is knowledge and self-control, and the second is control over the process.
b) Creative and critical thinking, which are ways of explaining how to carry out the process of thought. Marzano *et al*. (1998) argue that critical thinking is more than a repertoire of skills. Creative thinking and critical thinking are complementary, and should be promoted together in the context of regular courses. Each time the students are formulating a question, analyzing a text, or defining a term, they are using their critical thinking. One suggestion for encouraging critical thinking would be to help students be aware of this characteristics of the process, either by explaining it to them or by helping them realize how it operates.
c) Thought processes, which include the formation of concepts, principles of understanding, solving of problems, making decisions, research, composition and oral expression.
d) Basic skills, which can be summarized into eight categories, such as skills for orienting oneself toward the task, collecting data, remembering, organizing, generating, integrating and evaluating.
e) The content of the knowledge, which plays a role in this whole process.

The most significant difference between the application of a philosophical approach and that of a psychological one is the emphasis on processes. These models

* Translator's note: Before the feminist movement arose, in situations including both genders it was customary to use the masculine pronoun. Today, however, pronouns of both genders are used to a void what is now seen as sexist language. To avert the awkwardness of continually using "s/he", "hi s/her", we shall, in this paper, sometimes use the feminine pronoun, and sometimes the masculine.

emphasize the application of learning to real-life situations, and maintain that if students understand how their learning process functions, they can be helped to transfer what they learn into their daily life. Some examples can be found in Brandsford and Stain (2000), and Sternberg (1985).

Although the philosophical and psychological approaches (like those of Ennis or Marzano) are used in educational institutions, a combination of components of both approaches, philosophical and psychological, is identified as an educational model. Hence, when speaking of the educational approach, reference is made to an eclectic focus which generally offers a wide variety of tasks and methods of investigation and inquiry. In that sense, someone who works with an educational model hierarchically applies learning skills in the classroom, and encourages students to move toward levels of higher-order thinking. For example, to determine the use of a formula and how to evaluate the results in an algebra lesson involves the students' making decisions. The implementation of decision-making demonstrates a level of higher-order thinking (Sormunen and Chalupa, 1994).

Regardless of the method, most theorists in education support what research has confirmed: it is possible to facilitate the development of thinking skills. Hence, students who receive instruction designed for this purpose generally score higher than their peers who do not receive this type of training (Bransford and Stain, 1993; Costa, 1985; Facione, 1998; Hannel and Hannel, 1998, Mayer , 1998, Kerk, 1992, Nickerson, 1994, Potts 1994).

Critical thinking is regarded as one of the most important goals of education for institutions of higher education. For most researchers and experts in the field, critical thinking involves higher levels of thinking, and the role of teachers is considered central in this process. Critical thinking has been linked to reflective judgment, problem-solving, logical thinking, decision-making and the scientific method. It has been characterized as an intentional and self-regulated cognitive process. A person's attitudes, values and inclinations are also considered to be variables that affect critical thinking. Therefore, the disposition toward critical thinking is an important source of influence on students, one that should be considered, along with the design of objectives and tasks, so as to help them in the development and improvement of their processes of higher-order thinking.

The notion of critical thinking is a multidimensional concept involving several elements: intellectual (reasoning), psychological (self-awareness and disposition), sociological (socio-historical context), ethical (moral and values), and philosophical (ontological).

II. Methodology

This is an exploratory study of a quasi-experimental type, where the experimental group is defined as the one made up of student groups taught by teachers who had completed the Unimayab's Specialization in Teacher Leadership (ELD). In the design, two measurements were considered: before and after specialization.

2.1 Subjects

Participating in the experimental group were all the students whose teachers had completed their ELD training program at the beginning of 2003. For the control group there was selected a parallel group of students who were studying the same materials, or materials as close to them as possible. The selection was made, taking into account the school and semester of the experimental group. The plan was to have parallel courses in experimental and control groups, in terms of the curriculum and the semester.

At the beginning of the semester, there were involved a total of 437 students, of whom 175 were men and 262 were women. Of these participants, 219 were included in the experimental group, and 218 in the control group. Also invited to participate were 18 teachers, 9 of whom had just finished the training program, and in the 2003 spring semester would be teaching at the university; plus another 9 who agreed to participate, but did not receive the training, and would teach parallel control groups.

At the end of the semester, participating in the second round of this study were 425 students, of whom 171 were men and 256 were women. The students involved were from three schools: the College of Communication and Design, the Business College, and the College of Psychology and Family Sciences.

All the students volunteered to participate, and were informed about the purposes of research. The test was answered anonymously, and codes are used for organizing the data analysis. The data obtained were accumulated in a protected area in order to ensure the confidentiality of results.

2.2 Instruments

We used the California Critical Thinking Skills Test (CCTST) in its Spanish version, Form A, translated and marketed by the same company as the original English versions (California Academic Press, n. d.). The purposes of this test are to evaluate the individual's critical thinking and reasoning skills, and to provide data for the evaluation and research of programs on the development of critical thinking.

This standardized test has been designed for use with adults in a community college (undergraduate, graduate and professional schools). The scores it generates are a total score and the percentile regarding the standard for critical-thinking skills, the scores of subscales of the classical categories inductive and deductive reasoning, and the scores of contemporary subscales of analysis, inferences and evaluation.

Construct validity is supported by the Expert Consensus on Critical Thinking (known as the Delphi Report), and by a replica of research done at the University of Pennsylvania (sponsored by the United States Department of Education). The reliability of the test varies between 0.70 and 0.75 for the English version,

depending on the evaluation context of (California Academic Press, n. d., Palomba and Banta, 1999).

In addition, teachers answered a questionnaire designed to collect information related to gender; teaching experience; professional experience; training courses; levels of thought processes they have planned to develop during their courses; and distribution time in the use of different teaching strategies, such as expository methods, group work, independent work, and so on. The questionnaire also included questions related to any event that could have had an effect during the study.

2.3 Procedures

Assignment to the experimental and control groups was not random. The whole groups were used for the experimental group and for the control group. All students whose teachers completed their training course at the beginning of 2003, and who were teaching at the Unimayab, were invited to participate as part of the experimental group.

Instruction in the control group was direct—like that the students would have received in the normal curriculum. The experimental group received instruction in accordance with the ELD program.

At the beginning and end of the semester we used the California Critical Thinking Skills Test (pre-test and post-test) to evaluate possible changes in critical-thinking skills in both groups: control and experimental. The study was conducted during the spring semester of 2003 when the first group of graduates of the ELD program finished their studies.

III. Results

To find out whether the groups had differences in their total scores, they took a statistics test of analysis of covariance (ANCOVA) for a single factor, in order to examine the effect of the pre-test on the post-test in both groups: control and experimental. The test showed that the total score for the pretest was not significantly related to the posttest ($F(1,422) = .56$, $p > .05$). When each of the subscales was compared using the same procedure, the only relationship found was in the scale of induction. Table I shows the results.

Table I. ANCOVA in the subscales between the two groups

	Control group		**Experimental group**		**ANCOVA**	
Subscale	M	SD	M	SD	F(1,422)	P
Analysis	3.23	1.35	3.30	1.35	.42	.52
Evaluation	4.86	1.96	5.46	2.12	.29	.58
Inferences	4.79	1.67	5.13	1.71	.40	.53
Deduction	6.38	2.19	6.89	2.40	1.14	.29
Induction	5.09	1.91	5.62	1.89	4.27	.04*

*$p < .05$

Considering these results, we performed an analysis of variance (ANOVA) to compare the total scores of the test, and the scores of each of the five dimensions. The results of this comparison are described in Table II.

Table II. Differences in subscales between experimental and control groups

	Control group		Experimental group		ANOVA	
Subscale	M	SD	M	SD	F(1,430)	P
Analysis	3.23	1.35	3.30	1.35	.24	.62
Evaluation	4.86	1.96	5.46	2.12	9.25	.00*
Inferences	4.79	1.67	5.13	1.71	4.27	.04*
Deduction	6.38	2.19	6.89	2.40	5.24	.02*
Induction	5.09	1.91	5.62	1.89	8.28	.00*

*$p < .05$

During the 2003 spring semester, an academic member of the research team observed the 18 groups at least once during the semester. The length of each session was 90 minutes. During each session, the researcher observed and took notes on the teaching strategies used by the teacher, the level at which students were involved in the subject, the communication skills and leadership of the teacher, among other factors (see Appendices E and F). Table III describes the instructional strategies observed in the groups participating in this study.

Table III. Frequencies of instruction strategies observed in the 18 groups

Instruction strategies	Frequency	
	Control group	Experimental group
Expository method with little or very little movement around the classroom	1	0
Expository method assisted by the use of multimedia whiteboard or projector (little movement around the classroom)	2	7
Expository method assisted by the use of multimedia whiteboard or projector (Movement of the teacher around the classroom)s)	3	5
Method of questions *	0	5
Method of questions *	1	2
Oral presentations by students' *		

*Some teachers used more than one strategy.

The communication skills of the teachers were generally good. However, three of the groups showed very poor student participation. One of these belonged to the experimental group and two to the control groups. In these groups it was observed that students were distracted or directed their attention to other activities such as reading and conversation with peers. However, teachers tended to ignore these behaviors.

IV. Discussion

In reference to the question:"Are there significant differences between the thinking skills of students who received instruction from teachers trained in the ELD program, and those of students whose teachers were not in the program? The answer is that we found an overall improvement in critical-thinking skills in students who took courses from teachers with the ELD training, except in their skill concerning analysis.

The results of this research suggest that the ELD program had positive effects on the critical-thinking skills of students who took courses with professors who were graduates of this program. The experimental group had higher marks on the total test score and on four of the five CCTST subscales. Therefore, this program should be continued if we are to encourage critical-thinking skills at this level.

From the observations it was apparent that newly-graduated teachers tended to make more frequent use of the ELD strategies that promote reflection and analysis, and therefore increased their students' use of thinking skills. The strategies perceived as useful for this purpose were: in cooperation, developing specific strategies, where students had to use higher-order thinking skills; encouraging the discussion of assumptions and perspectives; and counseling students about how to think and how to work together.

The design of cooperative work assignments in small groups seems to foster high-level thinking skills, and supports what experts and research have maintained: that critical thinking can be developed within the classroom, and that students who think and reflect on ideas, concepts and problems in class, usually score higher than their peers who are not involved in these activities (Bransford and Stain, 2000; Costa, 1983; Facione, 1998; Hannel and Hannel, 1998, Mayer, 1998, Kerk , 1992, Marzano, 2003, Nickerson, 1994, Potts 1994).

Although gender differences were not the primary focus of this study, it was interesting to see how the instruction generally tended to reduce the gap reported in favor of males in connection with critical-thinking skills (Adedayo, 1999, Gallagher and De Lisi, 1994; Tiedermann, 2000, Wigfield and Byrnes, 1999). In fact, at the end of time specified for this study, gender differences were not so evident.

It could also be clearly observed that newly-graduated teachers had more teaching strategies available to them than teachers in the control group. As the results have shown, these strategies were effective, since they helped students develop thinking skills at higher levels.

V. Limitations

It is important to point out some external variables that could have had an impact on the results, and which may constitute a limitation on the consideration of the results.

It is important to emphasize the fact that all the teachers involved in this study were well-qualified teachers, committed to their task. However, it is impossible to establish, based on the results, whether the teachers most committed and interested were actually those who took the ELD program. Hence, the motivational factor may underlie the results. In that sense, for example, research has found that one of the most powerful predictors of teacher impact on students is the teachers' believing that what they do in their classroom can make a great difference (Marzano, 2003; Slavin, 2003).

Teachers who believe that the success of their students is primarily concerned with those students' individual characteristics, with their home environment, and with other factors on which the teacher can have no influence, are less likely to teach; in contrast, those who think their efforts exert a major influence on the success of their students are more likely to do so. A teacher who has a strong belief in his efficacy is more inclined to continue his efforts until his students achieve success (Bandura, 1997). In this study, nine teachers have made a consistent effort to develop the critical-thinking skills of their students. The results have shown that their efforts have made a difference.

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