

The Effectiveness of Reframing Strategy Based on Neuro Linguistic Programming (NLP) Principles in Modifying Alternative Thermochemistry Conceptions and Developing Achievement and Achievement Motivation among Low Achievers at the Secondary School

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Abstract:

This study aimed at diagnosing alternative conceptions about Thermochemistry concepts among a sample of first grade secondary stage students. The study also aimed at identifying the effectiveness of reframing strategy based on Neuro Linguistic Programming (NLP) in modifying alternative conceptions about Thermochemistry concepts and developing achievement and achievement motivation among low achievers at the first grade of the secondary stage. The sample of the study included low achievers from Abdelmonem Wasel Secondary/ Prep School and Abdelwahab Motawe Secondary/ Prep School. The experimental group studied the Thermochemistry unit using reframing strategy based on NLP while the control group studied the same unit using the traditional method. The results of the study revealed that alternative conceptions in the diagnostic sample reached more than 20% where the highest was 80% and the lowest 22%, which is a high percentage showing a clear weakness in correct scientific understanding of Thermochemistry concepts among the participants. The results also showed the effectiveness of the reframing strategy based on NLP in modifying alternative conceptions in Thermochemistry, and developing achievement and achievement motivation among low achievers at the first grade of the secondary stage. The study recommended the necessity of paying attention to preparing diagnostic tests for identifying the patterns of scientific alternative conceptions among the Chemistry students at the different educational stages. It also recommended including a part on diagnosing alternative conceptions and their treatment in the teacher's guide. Training in-service teachers on

diagnosing and using the reframing strategy based on NLP in modifying alternative conceptions and helping students to acquire the correct scientific concepts should also be paid more attention.

Key words: reframing strategy – Neuro Linguistic programming – alternative conceptions in Thermochemistry – achievement in Chemistry – achievement motivation

Introduction:

Recently, many recent discoveries have appeared in the area of research related to the brain, which crystalized the relationship between the structure of the brain and learning through understanding its structure. Throughout the last years, educators studied the relationship between classroom education and the new theories about how human beings learn. The exciting discoveries in Neurology and the conceptions of Cognitive Psychology, revealed new ways of thinking concerning the structure of the nervous system of the human's brain, perception and emotions which contribute to learning. Most neuroscientists believe that most brain connections result from experiences that individuals pass throughout the stages of their life. They also believe that Neuro-connections can be modified throughout the stages of life via new connections formed even at a late stage of the human age, the brain is not affected or developed by meaningless information and that the nature of the brain is linking the old to the new.

Neuro Linguistic Programming (NLP) is one of the sciences that depend on brain-based learning especially the formation of neural connections. Mahishika (2010) points out that NLP was founded by Bandler and Grinder (2010). Tosy and Mathison (2003) explain that NLP maintains that the individual is a system of mind and body together represented in neural, language and programming. In this respect, Boweiz (2010) mentions that NLP is the total of our abilities to use the language of the mind in a positive way that enables us to achieve our goals.

Shehata (2010: 24) sees that NLP consists of three factors: the first is Neuro which refers to all what happens in the brain and the nervous system, and the way through which the nervous system encrypts information, stores it in the memory, then

retrieves these experiences and information again when needed. The second is “linguistic” which refers to all kinds of speech, verbal or non-verbal, produced by the individual in his/ her communication with the others or with him/ herself.

The third is “programming” which means the representation it cares about the world, how it is in the mind, and how it affects our perception and behavior changing them into patterns of thinking and behavior which are the essence of our experience in life.

Alfiky (2009:16) explains that one of the basic principles of NLP is the “the map is not the territory”. This principle assures that everyone recognizes the world through his/her own map formed by the information we receive through the senses, the language we hear and read, and the values and beliefs. The principle “respecting and accepting the others as they are” pinpoints that everyone has a group of values and beliefs which identify his/ her pattern of behavior, and which make him/ her accept the differences rather than challenge the others. Besides, what a person does is the sum of his/her values, beliefs and experiences accumulated throughout the years. Another principle is “everyone has levels of conscious and subconscious communication”. This principle asserts that the subconscious mind can be positively programmed through the conscious mind. There is no failure. Rather, there are results and experiences. Therefore, the past lessons should be made use of in paving the ways to success in the present and planning for the future.

The previous principles of NLP are consistent with the principles of constructivist teaching. Caine and Caine (1999) agree that the teaching that is compatible with the brain depends on the idea that the brain is a dynamic, complex system with a social nature, searching for meaning is inherent in the brain and happens through encoding and that emotions are important for the process of encoding.

In this respect, Thomposn (2002) points out that NLP science aims at helping the person to understand meanings and their connotations, controlling the thinking processes and creating positive changes in their lives. NLP gained momentum in education due to its effectiveness in helping the students use the way through which they learn. This is what Gardener's theory (1983) for multiple intelligences asserts. It explains that learning styles such as visual, auditory and kinesthetic learning play an important role in students' teaching. Thus, teachers are required now to make use of NLP techniques and each learner's pattern of learning in the classroom, and re-accommodate the curricula to suit the students' patterns.

Altekreity (2003) affirms that sensory recognition is performed by the access of the information to the brain through the five senses. The brain encrypts the information, interprets and understands it. The sensation resulting from each of the five senses represents a special pattern of recognition. There are several educational strategies that depend on NLP techniques among which are Visualization and Metaphors, Reframing, Anchors and Modeling.

Lyall (2002) explains that the relationship between the teacher and the student is a dynamic one rather than from one side. The students behave according to the way they understood what they learnt. This agrees with the principles of NLP which indicates that the map is not the territory and interprets the alternative conceptions that the students form during the teaching and learning processes.

One of the basic concerns of NLP is a mental representation of information through visual, verbal or kinesthetic images which help the person in representing and processing information. This interprets the uniqueness of each pupil from the other. NLP depends on the dynamic relationship between the pupil's experience, his language and behavior since the student's representation of the information and its processes in the brain appears in his language, behaviors, skills and beliefs; and all of them can be learnt and modified. The main point that Appelton

(1997) pinpointed in the constructivist philosophy, and on which the strategies of conceptual change depend is that the person will use the previous ideas (alternative conceptions) in understanding the new experiences and information. Learning happens through changing the previous ideas through the new ones.

Zaitoun and Zaitoun (2003: 49) indicated that the process of acquiring previous knowledge is an active continuous process through which a person's cognitive structures are modified. Peter and Linda (cited in Bandler, 1973), the founder of NLP, pointed out that sensory impressions contribute in forming the sequence of every person according to the way each one used in representing the information in the brain. For example, the correct understanding of the chemical elements is formed as a result of the correct visual conception of the atoms and the molecule, and the relationship between them. Thus, when the teachers train their students on using the visual conceptions of the atoms and the molecules, they help them to understand the chemical concepts more. This indicates that the programming techniques may contribute to correcting alternative conceptions of the scientific concepts.

Nowadays, there are some difficulties that face students while learning Science, in general, and Chemistry, in particular. This is because the previous knowledge in their cognitive structure is one of the prominent factors that negatively affect their learning of these concepts, especially when the teachers ignore the alternative conceptions those students have while studying these concepts.

Kesan and Kaya (2007) defined alternative conceptions as the wrong recognition, belief or understanding that the students have about the specific scientific method agreed upon for the concept. Sencar and Eryilmaz (2004: 606-607) pinpointed that alternative conceptions are consistent, stable and resistant to change through the traditional methods of teaching. Hewson and Hewson (2003: 88) indicated that alternative conceptions are not limited to a specific gender or age group as they exist starting

from the beginning of the basic education stage and extend to the university stage. In addition, Moustafa (2006: 215) explained that alternative conceptions are not changed through traditional teaching because they do not help identifying these conceptions or diagnosing them. Therefore, these conceptions gained the traits of stability and resistance to change.

Abdou (2000) explained that conceptual change is the process through which the students' prior or alternative conceptions are modified to become consistent with the scientifically accepted ones; i.e. it is a dynamic process that necessitates reorganizing the learner's cognitive structure aiming at making the desired changes. Appleton (1997) agrees with Smith, Blackeslee and Anderson (1993) that there are strategies that help making conceptual change and correcting the alternative ones such as cognitive conflict strategies, the use of analogies and analogical bridges, constrictive analytical- based strategies, the learning cycle and V-map.

Teaching strategies used in modifying the alternative conceptions agree with the constructivist philosophy. One of the NLP- based strategies consistent with the constructivist philosophy is the reframing strategy. Almashany (2006: 40) pinpoints that the reframing strategy is the strategy through which an individual evaluates an experience to make it gain meaning. According to the chosen frame, the way of dealing with the same event extremely changes.

Heizer (2003: 266) defines reframing as the change of the experiment or the event's meaning by adding another frame around it. Reframing will enable the person to see things in a different way. It is the way through which we describe the experiences to identify their meanings. The frame reflects the aims or the ideas; so, if we modify the frame, the meaning of the experience will change. When we recapture the meaning, our emotions towards what was framed usually change. Reframing will enable the person to see things differently, which helps reaching a new interpretation that will lead to a different result, evaluation or emotions (O'connor, 2001: 234-236).

Aldawash (2008: 70) indicates that the reframing strategy deals with the results of recognition. Recognition represents an interpretation, explanation or giving meaning to what was sensed or attended to. Heizer (2008:70) assures that the meaning of an event depends on the frame through which we recognized the event. Therefore, the philosophy of the reframing strategy lies in reframing both content and context so that they become different from those in which the alternative or incorrect behavior was formed so that the incorrect behavior or understanding will be corrected. The learner's and teacher's mental state, training students to see things differently, and enhancing relationships should also be taken into consideration.

Bandler and Grinder (1982) see that the six steps for the reframing strategy are the best application for modifying the incorrect behavior or conception. These steps are:

1. Identifying the problem, incorrect behavior or conception that has to be changed.
2. Diagnosing the reasons for the incorrect behavior or conception.
3. Identifying the main reason for the alternative or incorrect conception.
4. Explaining the correct behavior or conception using analogy and metaphors strategy.
5. Relating the new response or alternatives to the context that most relate to the correct behavioral change or understanding.
6. Examining the extent to which the person agrees with alternatives of the correct behavior or concept.

In the field of Chemistry, there are many studies that dealt with the difficulties of its teaching, the low level of its students, the misunderstanding of its topics and its misapplication in life. Ali and Yousef (1999) indicated that there are many difficulties in understanding the chemical equations and understanding one or more of the components necessary for solving the chemical problems. The reason is that teachers focus on memorizing facts without paying attention to the students' acquisition of the

scientific concepts using certain strategies for solving chemical problems. Yousef (2002) described the current state of teaching Chemistry which focuses on memorization and does not encourage research or inquiry. Sakr (2004) showed that teaching Chemistry theoretically is useless since the ultimate aim lies in teaching Chemistry for life, and the fragmented and disconnected information has no place in the age of globalization. Alshafey (2005) pointed out that Chemistry lacks educational units which are based on planning and design that aim at arousing scientific understanding among the secondary stage students, extending their cognitive basis and using them effectively in the different situations. Albanna (2001) recommended using scientific thinking, and analyzing and implementing what is studied. Albaz (2007) revealed that there are difficulties that hinder studying and applying the concepts of chemical equilibrium. He attributed that to the absence of a strategy for demonstration and teaching the topics in a way that arouses thinking and motivates students' learning and use of their mental abilities. Sadeque (2004) also revealed difficulties in learning Chemistry and a lack of desire to learn it because it includes many abstract concepts in addition to the chemical problems that require higher thinking skills. Fathallah (2009) indicated that most behaviors and styles of teaching followed by Science teachers do not help develop the students' thinking.

Some studies revealed a relationship between achievement motivation and academic achievement. McClelland (1976) revealed a significant positive relationship between GPA and achievement motivation. Besides, Rashed (1994) found out a positive relationship between achievement motivation and academic achievement.

Farrouga (2011: 128) explains that the studies revealed the relationship between the student's success in studying and motivation. This is because motivation is considered a motivator that urges the student to work and persist. Persistence is one of the most important conditions for learning. Therefore, recent education points out the necessity of stimulating the students'

motivation towards the educational situations by infusing experiences that stimulate the students' motivation and satisfy their needs into the lessons (Alesawy, 2004: 42).

Examining the reframing strategy, it becomes clear that it is in line with the Bybee Constructive Model which consists of five stages: engagement, exploration, explanation, elaboration and evaluation. Moreover, the six- stage reframing strategy depends on analogy and metaphors which are constructivist teaching strategies.

Reframing strategy is distinguished from the conceptual change strategies in that it takes the affective side into account. Abdou (2000) explained that there are points of criticism of the conceptual change model due to the negligence of the non-cognitive factors such as students' motivation and classroom environment which, in turn, affect the processes of conceptual change. To the best of the researcher's knowledge, there is no one study that dealt with implementing NLP strategies in teaching, in general, and alternative conceptions, in particular.

Problem of the study

The results of the previous studies revealed some difficulties in learning Chemistry, and they also revealed alternative conceptions among the students in Chemistry concepts. In addition, they indicated that the methods and styles of teaching used in the classrooms resulted in the low level of the students' motivation and achievement. The results of the pilot study conducted by the researcher with 12 Chemistry teachers in New Cairo, East of Nasr City and West of Nasr City Directorates during a training course at the National Center for Examination showed that many students had alternative conceptions that are different from the correct scientific ones in the textbook, especially those in the thermochemistry unit at the first grade of the secondary stage.

Thus, there is a problem in teaching Chemistry at the secondary stage, i.e. the alternative conceptions for thermochemistry concepts among the first secondary stage

graders which lead to their low level in academic achievement and motivation. This study seeks to use a new strategy based on NLP principles and combine some strategies to modify the alternative conceptions. The problem of the study can be identified in the following main question:

How can alternative conceptions about thermochemistry concepts among the secondary stage low achievers be corrected using the reframing strategy based on NLP?

This question may be divided into the following sub-questions:

1. What are the alternative conceptions about the thermochemistry unit in Chemistry common among low-achievers at the first grade of the secondary stage?
2. How effective is teaching using the reframing strategy based on NLP in correcting the alternative conceptions about thermochemistry concepts among low-achievers at the first grade of the secondary stage?
3. How effective is teaching using the reframing strategy based on NLP in developing achievement in Chemistry among low-achievers at the first grade of the secondary stage?
4. How effective is teaching using the reframing strategy based on NLP in developing achievement motivation among low-achievers at the first grade of the secondary stage?

Aims of the study:

This study aims at:

1. Diagnosing the alternative conceptions about thermochemistry concepts among low-achievers at the first grade of the secondary stage.
2. Studying the effectiveness of teaching using the reframing strategy based on NLP in correcting the alternative conceptions about thermochemistry concepts among low-achievers at the first grade of the secondary stage.

3. Investigating the effectiveness of the reframing strategy based on NLP in developing achievement in Chemistry and achievement motivation among low- achievers at the first grade of the secondary stage?

Importance of the study:

This study is important in:

1. Introducing a strategy that may help correcting alternative conceptions in Chemistry and developing the main scientific concepts and achievement motivation among secondary stage students.
2. Introducing a teacher's guide that may be used in teaching chemical topics using the reframing strategy for correcting alternative conceptions in Chemistry and developing the main scientific concepts and achievement motivation among secondary stage students.
3. Introducing samples of tools for measuring achievement motivation, diagnostic tests and achievement as guides for use when assessing the secondary stage students in Chemistry.
4. Calling the educators', curricula designers' and teachers' attention to the necessity of using approaches and strategies that suit the nature of the secondary school low-achievers in Chemistry.

Delimitations of the study:

1. A sample of low-achievers in Chemistry at Abdelmonem Wasel Secondary/ Prep School and Abdelwahab Motawe Secondary/ Prep School, New Cairo Directorate.
2. The thermochemistry unit in the Chemistry textbook for the first grade, secondary stage due to the students' frequent complaints.
3. Three dimensions of academic achievement motivation: taking the responsibility, competition and desire for excellence, and self-confidence and self-respect which were mentioned by many studies as the most variables saturated with academic motivation.

4. The first three levels of Bloom (knowledge, comprehension and application) in assessing achievement in the thermochemistry unit.

Method :

The study followed the descriptive method in identifying the bases of developing the program proposed. It also used the quasi-experimental method concerning the procedures of the study and controlling the variables. The study used pre/ post two groups (experimental and control) design as follows:

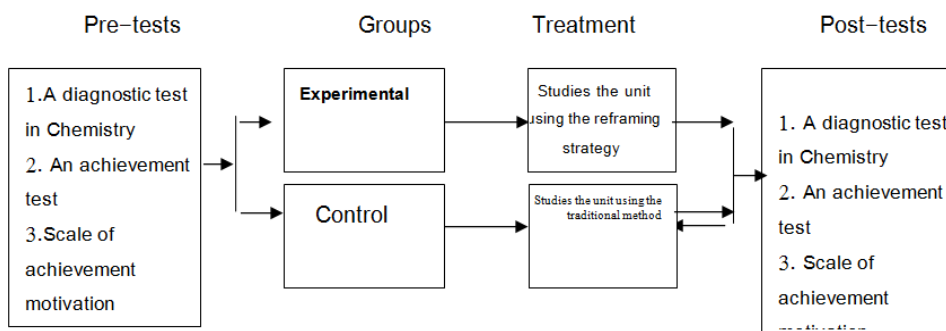


Figure 1: The experimental design

Hypotheses of the study:

1. There is a statistical significant difference between the mean scores of the students in the experimental and the control group in the post diagnostic test as a whole and its dimensions in favor of the experimental group.
2. There is a statistical significant difference between the mean scores of the students in the experimental group in the pre-post diagnostic test as a whole and its dimensions in favor of the post test.
3. There is a statistical significant difference between the mean scores of the students in the experimental and the control group in the post achievement test as a whole and its dimensions in favor of the experimental group.

4. There is a statistical significant difference between the mean scores of the students in the experimental group in the pre- post achievement test as a whole and its dimensions in favor of the post test .
5. There is a statistical significant difference between the mean scores of the students in the experimental and the control group in the post achievement motivation scale as a whole and its dimensions in favor of the experimental group.
6. There is a statistical significant difference between the mean scores of the students in the experimental group in the pre-post achievement motivation scale as a whole and its dimensions in favor of the post.

Terms of the study:

Alternative conceptions: They refer to “ the conceptions, information and interpretations that are held by the secondary stage first graders and incorrectly related to thermochemistry concepts , and at the same time they are not consistent with the correct scientific interpretations of those concepts. They can be diagnosed by the score the students get at the diagnostic test of alternative conceptions in thermochemistry prepared for this purpose”.

Achievement motivation: This refers to “the desire to perform well and achieve success. It is a personal aim that activates and directs behavior. It is also the score the student gains in the achievement motivation test including the three dimensions : taking the responsibility, competition and desire for excellence, and self-confidence and self-respect ”.

Low achievers: In this study, they will be referred to as “ the students having less than 60% of the total score in the Chemistry achievement test”.

Neuro- Linguistic Programming (NLP): It is operationally defined as “the science which searches for helping people to

understand meanings and their connotations, controlling the thinking processes and making positive changes in their lives”.

Reframing strategy: It is operationally defined as “the strategy that depends on changing the frame from which the alternative or incorrect conception resulted by changing the experience or the situation, or a part of it, to form a new conception that suits the correct concept”.

Review of literature and related studies:

Neuro- Linguistic Programming (NLP):

NLP science is considered one of the helping means of changing the human being’s behavior. It is the science of psychological engineering. This science is concerned with changing the self and affecting the others through developing thinking, refining the behavior, changing the habits and supporting the abilities. NLP is the group of our abilities to use the language of the mind in a positive way that enables us to achieve our goals (Alfegy, 2009). NLP is based on Bandura’s Social Learning Theory (Bandura, 1989). Bandler and Greinder used modeling, as a part of this theory, for preparing the models. Their main focus was building bridges between the traditional theories and the cognitive theories of personality through assuring the concept of self-efficacy.

NLP is developing some theories with a positive disposition in their vision to the human beings and it provides them with the tools and techniques by which they can change their behaviors and achieve the goals they aim at .

NLP is the technology of success and excellence, and discovering the potential energy and the abilities hidden inside you. It mainly focuses on studying the state of excellence and creativity in the persons, identifying excellence and how to partition it into its initial elements, then applying it to others in order to enhance their practical performance. It provides us with a step by step recipe for excellence and getting rid of the difficulties of life (Soliman, 2007: 3).

NLP has more than one definition. Some define it as the art and science of making the person reach excellence by which he achieves goals and raises the level of his life. Others define it as a group of our thoughts, feelings and behaviors resulting from our habits and experiences which affect our communication with the others and on which our pattern of life is based (Soliman, 2006: 16). Joseph (2006) defines it as a behavioristic science that provides you with theory, practice and technique in order to change and affect.

NLP science or Neuro- Linguistic Modeling science appeared as a separate science in the mid-1970s by Grinder and Bandler when they published the first book in which they mentioned their discovery named "The Structure of Magic". Then, this science took wide steps in the 1980s. Its centers and training institutes spread in USA, Britain and some European countries. You do not find any of the industrial countries without a great number of centers and institutions for this new science (Salman, 2006: 17).

Mahishika (2010: 203) mentions that NLP goes to Richard Bandeler when he was a student at California in Santa Cruise, USA and John Grender, professor of linguistics at the same university. The two examined Freitz Berliz' work and analyzed the work of Verginia Sateier, a specialist in problem solving and family relations. Through this experience, both Bandeler and Gerender developed the basic process on which NLP is based, i.e. designing and preparing models.

Susie and Michael (2007:6) mention that NLP is based on the behavioristic cognitive trends and those focusing on problem solving. Both trends are based on explaining the aims, harnessing all energy and resources, and focusing on meaning, potentials and solutions rather than the problem. They also emphasize the importance of feedback, maximizing the value of the successful used strategies and replacing those that did not achieve success with other successful ones. Therefore, NLP focuses on helping the client to change and monitor his physiological, Neuro and emotional states directly. All the sensory representation systems

are used for this purpose. Thus, the attitude towards oral treatment rooted in the trends of treatment which focuses on problem solving decreases. Hall (2006), Dilts (2000: 577), Soliman (2014: 216), Halloul (2011: 164) Fayed (2013), Alshafey (2013: 31) and Heizer (2010,21) identified the assumptions upon which NLP is based as follows:

- **The map is not the territory:** All of us recognize the world through our own map formed by the information we receive through our senses, the language we hear and read, the values and beliefs we assimilate.
- **Behind every behavior is a positive destination:** Everyone has motives behind any behavior. It is a must to separate behavior from intentions and not to judge a person by one behavioral pattern. It is also important to realize the intention which justifies the behavior.
- **I control my mind, then I am responsible for the results of my acts:** A person's aptitude and acceptance to carry over the responsibility for his behaviors and acts make him capable of directing his potentials towards achieving his goals.
- **The mind and the body affect each other:** Internal representation or self-talk will affect facial expressions and body movement. Thus, it will affect the person's feelings and sensations. A person's understanding of himself makes him more controlling of his feeling status.
- **The person who is more flexible can control:** Flexibility is the power that leads to better results.
- **There is no failure but experiences and experiments:** We should make use of the lessons from the past in paving the way to success in the present and planning for the future.
- **People use their best choice:** What a person does at a specific moment is the total of his accumulating values, beliefs and experiences over time.

- **If a person is able to do anything, he can learn and do it:** Knowing what the specialists and distinguished do and modeling them leads to marvelous results. You have to follow the steps that led to their excellence. You have also to identify your aim precisely and have the desire to achieve it. You can reach faster if you model a person who has the same aim and could achieve it, and follow his way to reach the same aim.
- **We cannot do without communication:** A person's way of communicating his ideas identifies the kind of response he gains.
- **A choice is better than no choice:** variety of choices and availability of alternatives gives a bigger opportunity for controlling the results. Having one choice does not make chance for variation. Having two choices makes you at a loss. Having variety gives you more power. In case of not giving alternatives in the communication process, you break the rapport.
- **Respecting and accepting the others as they are:** Everyone sees things from his own perspective. We are different in recognizing things; therefore, we'd rather respect and accept the others as they are so that we can immediately communicate trustfully and respectfully. We then can help them and make a desired positive change. These principles are consistent with the principles of cognitive learning except the constructivist:
 - Learning is a constructivist continuous process.
 - The best conditions are created when the student faces a real problem.
 - The learning process includes a person's re-creation of his knowledge through a social negotiation process with the others.
 - The learner's previous knowledge is a basic condition for building meaningful learning.

The learner's previous knowledge is a basic condition for building meaning since interaction between the learner's new knowledge and his previous knowledge is important. Children build cognitive systems for themselves to use in interpreting phenomena and the events in the environment in which they live. This gives meaning to their experiences. These spontaneous cognitive or personal systems may contradict the prominent scientific perspective, i.e. they may contradict the current scientific data. This phenomenon is known as misunderstanding, misconception or alternative conceptions (Zaitoun and Zaitoun, 2003: 98).

Blackerby (2002) mentioned that NLP can be efficiently applied in enhancing the students' educational results. Using the principles of NLP, we can make use of the behavioristic flexibility to approach the educational process in new and exciting directions.

Proponents of NLP believe that students face difficulties in learning either because of following the representation systems badly (usually visual or auditory), use of inappropriate or ineffective learning strategies which limits beliefs/ expectations related to learning, or the inconsistency of teaching strategy with the student's learning pattern (Dilts, 1995). James (1996) assures that learning strategies are one of seven basic categories of the strategies identified by NLP in addition to memory, decision making, creativity and motivation.

Dilts (1995) points out that there is no single strategy that is always appropriate and that a series of specific representation systems tends to be more appropriate in learning tasks of Algebra or Organic Chemistry when it entails retrieving internal visual and auditory memory of formulas and graphs. Many studies showed the effectiveness of NLP in developing learning skills. Esterbrook (2006) investigated the effectiveness of NLP in enhancing learning skills among low achievers. The results of the study indicated a positive change in the experimental group in self-concept, social skills and achievement. Concerning the supervisors' skills, Alshereif (2008) studied the effectiveness of

NLP in enhancing supervisors' skills of observation, attention and speed of recognition, and reasoning abilities. The results of the study showed that there was a statistical significant difference in the pre-post scale of observation, attention, recognition and reasoning abilities in favor of the post administration for the experimental group.

Shehata (2010) examined the effectiveness of training in NLP in developing the level of ambition among a sample of hearing impaired adolescents. The study revealed the effectiveness of training in NLP in modifying the level of ambition among the experimental group. Emam (2011) investigated the effectiveness of a program based in NLP techniques in enhancing psychological and academic adaptation for slow learners. The results indicated a significant statistical difference between the mean scores of the experimental and the control group in favor of the control group in the post administration of the scale of psychological adaptation.

Concerning the use of NLP techniques, Fayed (2013) investigated the effectiveness of the reframing strategy based on the NLP techniques in increasing the level of self- control of some behaviors inside the classroom among a sample of the prep stage students. The results showed a statistical significant difference between the pre-post test of self-control for the experimental group.

There are many strategies of NLP. Reframing is a strategy that enables the person to see, evaluate or feel things differently (Heizer, 2000). Almashany (2006: 40) defines it as a strategy through which the person evaluates an experience to make it gain meaning. According to the frame chosen, the way of dealing with the same event extremely changes.

From the previously mentioned studies, the researcher can define the *reframing strategy* – operationally - as a strategy that depends on changing the frame from which the alternative or incorrect conception resulted by changing the experience or the situation, or a part of it, to form a new conception that suits the

correct concept. This is because the meaning of any event depends on the frame by which we recognized this event. Thus, the philosophy of reframing lies in reframing the content and the context to be different from those in which the incorrect behavior had been formed .This helps correcting the incorrect behavior or understanding.

Based on this, the steps of the reframing strategy for modifying alternative conceptions are:

1. Identifying the frame of the concept's prior conceptions.
2. Increasing motivation for changing the old frame.
3. Introducing the correct concept.
4. Forming an appropriate frame for the correct concept.
5. Deepening the correct concept.

Alternative conceptions:

Studies confirmed that the scientific concepts the students form are not sometimes consistent with the correct ones that may hinder acquiring new information. This phenomenon is known as the *alternative conception* (Alattar, 2003: 62). Zaitoun and Zaitoun (2002: 227) explain that the concept of the alternative conception was used to describe an unaccepted interpretation but not necessarily incorrect. Alsadany (1994: 50) defines alternative conceptions as conceptual knowledge or pictorial ideas that are not consistent with the scientifically accepted common terms.

Aldesouky (2003: 95) defines alternative conceptions as “the impressions that the students form about the different events and the natural phenomena as a result of their direct contact with them before receiving intentional continuous learning”. Abdel-Meseih (2001: 95) defines them as “ideas, knowledge and interpretations about phenomena that exist in the person’s mind and contradicts the accepted scientific interpretations reached by scientists”. Moustafa (2001: 151) believes that the alternative conception is “the students’ ideas and beliefs about scientific concepts and phenomena which have

contradictory meaning to that accepted by the specialists in teaching Science and Science Education”.

In light of the previous definitions, alternative conceptions can be defined as “the conceptions, information and interpretations that are held by the secondary stage first graders and incorrectly related to thermochemistry concepts , and at the same time they are not consistent with the correct scientific interpretations of those concepts. They can be diagnosed by the score the students get at the diagnostic test of alternative conceptions in thermochemistry prepared for this purpose”.

Moustafa (2001: 151) elaborates on the importance of identifying alternative conceptions about the scientific concepts and phenomena among the students as follows:

- Directing the appropriate approaches and styles for dealing with the children’s concepts making the appropriate changes in the content of the Science curricula.
- Using current educational untraditional techniques that maintain the correctness of the scientific language and word meanings of the teacher as well as the students that might lead to correct understanding and assimilating correct scientific concepts.
- Identifying students’ scientific background contributes to understanding the sources and reasons of alternative conceptions, and overcoming them through enhancing the rapport between the students and the teacher.
- Making sure of not adding the alternative conceptions to the scientific concepts prescribed in the course given lest the latter should be affected in a negative way. This requires making radical changes for students’ conceptions.
- Identifying the differences between the daily language use of concepts common among the students and the scientists’ conceptions may contribute to developing students’ technical language that their language would be precise and have specific meanings.

- Many scientists (e.g., Moustafa, 2006: 151; Sencar and Eryilmaz, 2004 and Hewson and Hewson, 2003: 88) maintained that alternative conceptions have many characteristics and attributes that can be identified as follows:
 - a. Alternative conceptions are not formed suddenly. The student needs time to form them. They develop as time goes on, and more alternative conceptions may be built on them.
 - b. Some patterns of alternative conceptions are not logical from the science perspective as they contradict and differ from the scientific interpretation. However, , they seem logical from the students' perspective as they are consistent with their cognitive structure.
 - c. Alternative conceptions are resistant and this makes them difficult to change, especially when using traditional methods of teaching.
 - d. Those conceptions are often acquired at an early age though their existence is not limited to a specific age.. Therefore, they exceed the age and educational level limits.
 - e. New strategies concerned with conceptual change can be used in modifying alternative conceptions inside the classroom.
 - f. The students' alternative conceptions may affect their thinking even after being taught those conceptions. Students continue to be persuaded with their previous thinking and concepts which affect their interpretations of the scientific phenomena.
 - g. Alternative conceptions negatively affect learning the correct concepts. They hinder the student' correct understanding and support the patterns of alternative understanding, thus, hinder subsequent learning.

How to modify alternative conceptions:

Modifying alternative conceptions or getting rid of them require that the students move through a stage of development

in which clear conformity between the alternative conception and the correct scientific conception appears and a cognitive conflict or mental unbalance happens. Consequently, students should be helped to move from the scientifically accepted concept which helps them to discuss their ideas and conceptions to reaching better interpretations which removes the cognitive unbalance state they experience.

Zaitoun (1988: 130) identified conditions for conceptual change to happen as follows:

1. The student should not be satisfied with his current concepts.
2. The student should have the least possible score in understanding the new concept, i.e. clarity of the new concept.
3. The reasonability and usefulness of the new concept should be made clear for the student.
4. The new concept's interpretive and predictive power should appear through introducing new discoveries and precognitions that the alternative conception did not introduce.

Many educators and researchers (e.g., Alkhalily, 1996; Sabry and Abder-Rady, 2010) suggested many strategies for getting rid of alternative conceptions and replacing them with the correct ones. These strategies and techniques are called conceptual change techniques. Some of them are: cognitive conflict strategies, use of analogies and analogical bridges, learning cycle, general constructivist teaching model, conceptual maps, v-diagram map, metacognitive strategies, and scaffolding strategies.

This study seeks to modify alternative conceptions in thermochemistry through the reframing strategy based on NLP. This strategy is distinguished in that it includes many of the aforementioned strategies. For example, the first and second steps, identifying the frame of the concept's prior conceptions and increasing motivation for changing the old frame, are done through cognitive conflict. The third stage, introducing the new

concept, is related to the constructivist model, discussion and practical presentations. The fourth step, forming an appropriate frame for the new concept, resembles the analogy strategy. The fifth and last step, deepening the concept, is related to the metacognitive strategies.

Motivation and achievement:

Concern in motivation and achievement is attributed to their importance in many practical and applied fields and domains such as the economic, administrative, educational and academic ones. Motives are an important factor in directing and activating a person's behavior and the people surrounding him. Achievement motivation is a basic component in a person's search for achieving and assuring himself through whatever aims he achieves and a better style of life he seeks.

What is achievement motivation?

Younis (2009: 149) defines achievement motivation as "a person's desire and inclination to overcome obstacles and strive to perform difficult tasks well and fast as possible. The continuous desire of excellence, seniority or performing tasks superiorly is a characteristic of unique people with a high level of achievement motivation," (Mathana, 2010: 17).

Abdullah (2011) defines achievement motivation as a person's aptitude to take the responsibility and seek for excellence to achieve certain goals, resistance to overcome obstacles he faces, mastery and perfection of work, self-confidence and independency, and direction towards the future.

From a similar point of view, Alamoudy (2012: 227) defines it as "the students' readiness to take the responsibility, show continuous desire for success, performing difficult work, and overcome obstacles efficiently, effortlessly and in the best level of performance".

Manifestations of achievement motivation

There are many manifestations of achievement motivation: level of ambition, risk taking, group mobility, persistence, task

stress, time recognition, direction towards the future, selecting the mate, recognition, and achievement (Yousef, 2011: 112). Persons with high achievement motivation are characterized by some characteristics: a) They prefer to work on tasks that challenge their abilities and that promise success. b) They do not accept tasks in which success is sure or impossible. c) They prefer tasks in which their performance is compared to others'. d) They choose more realistic tasks, works or professions., and e) They have more ability to match their abilities and the tasks they choose well (Alzayyat, 2004: 456). Also, those students can be characterized by the following: a) They prefer to choose tasks for which they realize the expected results and the effort to be exerted for completing them. b) They are described as independent and having innate values. c) They tend to do their work desiring for achievement per se not for satisfying people. Thus, they are characterized as being independent and unique characters.

It is worth noting that a person's knowledge of his real direction of motivation helps him much to control, direct and monitor it. A person's knowledge of the motives of the others around him enables him to have good relationships with them (Alkabsy et al., 2000: 56).

Educationally speaking, motivation is one of the important educational aims. The educational process seeks to stimulate the students' motivation and direct it in a way to achieve the ultimate goals of this process. The school also tries to generate different concerns: cognitive, physical, or artistic, among the students so that they make use of them outside schools and be a support for them in their future lives in general (Saady, 2001).

Achievement is success and speed of performance. Although there are many definitions for achievement motivation, Murray, Atkinson (1964) and Maclelland (1976) are the most famous. Murray (2005: 16) defined achievement motivation as doing things the others see difficult, controlling the physical and social ecology in thoughts, organizing and treating them well, speed of performance and independency, overcoming obstacles,

reaching the standard of excellence and exceeding the self, competing the others, self-esteem for the successful ability (Shehaza, 2005: 16).

Macclelland's theory (1976) maintains that achievement motivation is the response of expecting the positive or negative aims which are raised in situations that include seeking for a certain level of excellence or superiority where performance is evaluated as success or failure (Kashkoush and Mansour, 1979: 37).

Maslow's theory (1954: 35) is considered one of the greatest theories of motivation. It confirms that needs are arranged hierarchically from the psychological perspective and from physiological needs to more mature and humanistic needs. He assumes five levels of the basic needs system.

Concerning the relationship between NLP and achievement motivation, Halloul (2011) identified the effect of NLP in developing achievement motivation among a sample of students at basic education in Gaza. The results showed statistical significant differences between the mean scores of the pre-post scale of achievement motivation for the experimental group in favor of the post.

Achievement motivation is considered an indicator of the students' performance and academic achievement. Abdelsamei (2000) and Nelon (2003) revealed a positive relationship between academic achievement and achievement motivation. Abdelhamid (1995) also revealed a positive relation between them. Alsafy (2000) investigated the relationship between achievement motivation and aptitude among a sample of 180 excellent and slow learners in the literary and the scientific section. Results of the study indicated a significant relationship between achievement motivation and aptitude.

Concerning developing achievement motivation, Shehaza (2005) investigated the effectiveness of a program for developing achievement motivation among 78 second graders at the prep stage. Scales of achievement motivation, attitude

towards risk, and level of ambition were used. The results indicated statistically significant differences between the experimental group's scores in the pre-post administration in favor of the post in the three variables. Shawashra (2007) identified the effectiveness of a program for stimulating the students' motivation and developing academic achievement among low achiever students. The results showed the effectiveness of the program in stimulating motivation and developing academic achievement.

Thus, the teachers have to do their best for reinforcing the students' attitudes and increasing their motivation for learning. They have to use strategies for stimulating motivation and providing more opportunities for transferring experiences to new situations, and increase the tasks of purposeful learning.

Low achievement students

Shoair (2003: 552) defines the low achiever as a student who failed before in the monthly tests in the first term, then at the end of the semester. Their IQ ranges from 75 to 90. Albalwashy (2007: 103) defines low achievers as the students who get less than 60% of the total score of the subjects they study. They are also defined as a category of students who enjoy all the abilities and potentials that the normal students enjoy except that they get less than 50% in the achievement test (Badr, 2012: 129). Consequently, a low achiever is the one who cannot achieve the desired level based on calculating the average and standard deviation.

Reasons behind low achievement

There are some reasons that lead to low achievement such as the low level of the students' mental ability, some problems in hearing and seeing in addition to some emotional reasons, lack and/or distraction of attention, and some familial or social problems (Alshehry, 2004: 53). Badr (2012) used a suggested active learning strategy for developing thinking skills and found out its effect among low achievement female students. Results of the study revealed the effectiveness of teaching using active

learning in developing higher order thinking skills among low achievement female students at the intermediate stage.

Procedures of the study:

To answer the questions of the study and check the validity of its hypotheses, the following procedures were followed:

1. Reviewing literature and related studies related to NLP, reframing strategy, modifying alternative conceptions and developing achievement motivation.
2. Selecting the scientific content which is a unit from the first grade, secondary stage textbook for the academic year 2014/ 2015. The unit is about thermochemistry and includes two chapters: the thermo content (enthalpy) and forms of change in the thermo content. This is because studies indicated the importance of having the thermochemistry concepts as they are included in the basic concepts in Chemistry. In addition, they represent the basis in Thermodynamics included in the university courses.
3. Identifying the aim of studying thermochemistry:
 - a. Modifying the alternative conceptions of thermochemistry.
 - b. Fostering the students' acquisition of achievement motivation represented in taking the responsibility, competition and desire of excellence, self-confidence, and self-respect.
4. Analyzing the content of the unit: Preparing the research instruments and the teacher's guide necessitated content analysis of the unit. Therefore, the content of the thermochemistry unit specified for the first graders at the secondary stage during the academic year 2014/ 2015 was selected because it includes basic concepts about the thermo content and its forms. They are among the basic bases for learning Chemistry. It also includes many practical experiments the students' conduct which increases their motivation for learning. However, the students find difficulty in identifying these concepts

accurately as revealed by the interviews with some teachers.

- a. The aim of content analysis: Identifying and extracting the basic concepts through adhering to the operational definition of the content and the verbal connotation of each concept according to what is mentioned in the textbook.
 - b. Reliability of the content analysis: Content analysis was conducted twice with a three weeks interval using the same procedures and the principles of content analysis of the first one. Holsti's equation (1969: 140) was applied to find out the relationship between the results reached in the two analyses. The correlation coefficient was 0.82 which is an acceptable one and indicates reliability of the analysis and possibility of confidence in the results of the analysis.
 - c. Validity of the analysis: After finishing the content analysis of the unit, extracting the basic concepts and identifying the verbal connotation of each concept in a list, the list was submitted to a panel of Chemistry teachers and supervisors in addition to university professors (specialized in non-organic Chemistry) to judge the appropriateness of the concepts to the topics of the unit considering them the basic issues to use when teaching the unit using the reframing strategy. The jurors indicated the scientific correctness of the definitions. However, some of them recommended adding some concepts the students studied before as warming up for the new concepts. In light of the jurors' opinions, the concepts were put in their final form in the list with their verbal connotation (Appendix 1).
5. The teacher's guide: It was prepared for the teacher to follow while teaching the unit. It included:

- a. An introduction: This included the aim of using the guide and some general guidelines for the teacher about how to implement the reframing strategy.
 - b. Aims of teaching the topics: The general aims for teaching the topics were identified and presented in the teacher's guide.
 - c. A time plan for teaching the topics: A timeline was prepared according to the time plan identified by the Ministry of Education which specified three weeks: five periods a week for teaching the unit.
 - d. Lesson plan: the lessons were organized so that each includes a title, operational objectives, the materials needed, procedure of teaching in light of the reframing strategy and lesson evaluation.
6. Validating the guide: the guide was submitted to a panel of jurors to get their opinion concerning the following:
- a. Correctness of the objectives and appropriateness of the activities.
 - b. Appropriateness of the lesson plan according to the reframing strategy.
 - c. Suitability of the worksheets to the teaching activities.
 - d. Suitability of the evaluation tasks.

The jurors gave some comments, and the modifications related to the activities were carried out. The final form of the guide is in Appendix 2.

7. Preparing the student's book: The researcher prepared a student's book which included:
- a. The lessons of the unit,
 - b. Learning outcomes for each lesson,
 - c. The activities for each lesson, and
 - d. Worksheets for the activities.

In light of analyzing the content of the unit and the aims, the teaching activities were prepared for the teacher to use while teaching the unit and give feedback. This reflects the philosophy of using the reframing strategy to help each student to correct the alternative conceptions he has.

- Activities for identifying the frame of the concept's prior conception.
- Activities for increasing the students' motivation for changing the old frame of the incorrect conception.
- Activities for forming a new frame for the correct conception.
- Activities for deepening the conception.
- Exercises after each lesson related to the learning outcomes.
- Self- evaluation activities.

After preparing the students' book, it was submitted to a panel of jurors to identify its appropriateness for achieving the desired aims of the current study, suitability of the educational activities, evaluation techniques and the language used.

The researcher modified the student's book either by omission, addition and/ or modification till the book appeared in its final form (Appendix 3).

8. Preparing the instruments of the study: To identify the effectiveness of the reframing strategy in modifying the alternative conceptions of thermochemistry, achievement and achievement motivation, three instruments were prepared: an achievement test, a diagnostic test and a scale of achievement motivation. The following procedures were followed:

The achievement test: This was prepared as follows:

Identifying the aim of the test

This test aims at measuring the achievement of first graders at the secondary stage of the thermochemistry topic presented in the two chapters about the thermo content and change in the thermo content, at three levels: knowledge, comprehension and application.

Content analysis of the unit: The content of the unit was analyzed according to Bloom's taxonomy for the cognitive domain and relative weights for the cognitive aims included in the two units according to the first three levels (knowledge, comprehension and application) were identified.

Formulating the test items: Test items were formulated in the form of multiple-choice followed by four different alternatives taking into consideration the criteria of preparing this kind of questions and phrasing the test instructions clearly and appropriately in a way that shows the students how to answer the test items.

Test validity: To check test validity, it was submitted to a panel of jurors specialized in methods of teaching Science to validate the comprehensiveness of the items, their suitability to the aims and content of the program, preciseness of their formulation, their relationship to the cognitive levels (knowledge, comprehension and application) and preciseness and clarity of instructions. In light of the jurors' opinions, modifications were made and the final version of the test included 30 items.

Piloting the test: The test was administered to a piloting sample that consisted of 25 first graders at the secondary stage at New Cairo Educational Directorate, Cairo Governorate, who finished studying the unit according to the traditional method. The following are the results of the pilot study:

Test reliability: Test reliability was calculated using Kudor Richardson formula (Allam, 2000: 164). Reliability coefficient was 0.77 which is an acceptable and suitable one and indicates validity of the test for application and measuring the first secondary stage graders' achievement in the thermochemistry concepts.

The time needed for answering the test: This was calculated by estimating the average of the time taken by the student who completed the test first and the one who completed it last. The average was 30 minutes.

In light of the previous results, the test in its final form consisted of 30 items distributed to the topics of the unit and the cognitive levels as shown in Table 1.

Table 1: Specifications of the achievement test

Level content	Knowledge	Comprehension	Application	Total	Relative weight
Thermo content (enthalpy)	1·3·5	·7·9·11·13·15·17 29·19	·23·25·27 21	15	%50
Forms of change in thermo content	2·4·6	·10·12·14·16·18·20 8	·24·26·28·0 22	15	%50
Total	6	15	9	30	
Relative weight	20%	50%	30%		100%

Thus, the test became in its final form ready for use and the results gotten from it can be trusted (Appendix 4).

The diagnostic test:

Aim of the test:

The aim of the diagnostic test is diagnosing the alternative conceptions about the concepts of thermochemistry. This was prepared following these steps:

- **Identifying a list of concepts included in the thermochemistry unit:** The content of the thermochemistry unit (the thermo content and change in the thermo content) specified for the secondary stage first graders was analyzed to identify the scientific conceptions. In turn, the alternative conceptions about these concepts were identified. The results of the analysis reached 13 basic concepts in the thermochemistry unit. After a period of time, the analysis was conducted again and the same concepts were reached. This indicates the reliability of the analysis. Validity of the analysis was ensured by reviewing previous studies that identified the basic concepts at the same unit. The list of concepts was submitted to a group of

experts and professors in curricula and methods of Science teaching. They suggested the omission of three concepts (specific heat, entropy and thermodynamics). Thus, the total number of concepts in the unit was 10: the system, the thermochemistry equation, exothermic reaction, endothermic reaction, enthalpy (thermo content), heat capacity, heat of melting/ fusion, mitigate heat, heat of combustion, heat of formation)

- Identifying the alternative conceptions: The alternative conceptions about the basic concepts were diagnosed through:
 - The researcher's experience in teaching Chemistry at the secondary stage.
 - An interview with supervisors and teachers of Chemistry (n=12) during their training for promotion in the teacher's cadre training.
 - An interview with a sample of secondary stage first graders (other than the sample of the study) who studied Chemistry during the first term. The interview started with an open question where each student was left to talk freely, at the time following the thread that will lead his thinking to deductions and trying to direct the way of his thinking by helping him to present what helped him to reach these deductions, reasoning, prediction or justifications. The interview included questions such as "What do you know about heat of formation? What do you know about the reasons for releasing heat when CO₂ is formed?".

The purpose of this was to find out the conceptual structure formed among the students and identify their conceptions in it. Each student had to write all he knows about each concept (total 10 concepts) separately in the list of concepts in details. Then, all students were interviewed for discussing interpretation of their responses.

- Leaving the students to talk freely, then, through analyzing the records of the interviews, many alternative

conceptions for each concept of the ten ones were identified.

- Reviewing literature, related studies and diagnostic tests of the alternative conceptions.

Preparing the test items:

The researcher made use of the list of scientific concepts and alternative conceptions for each concept in preparing the test items. It is of dual-multiple choice kind. The first part consists of multiple-choice question with four options including only one correct choice.

The total number of the items in the diagnostic test was 25. The test included two questions for each concept ($10 \times 2 = 20$ questions) in addition to a question that includes the relationship between each two concepts (5 questions).

Test instructions:

Test instructions included a simple idea about the aim of the test, number of its items, how to answer the test and mark the answers in the separate answer sheet and an example that illustrates how to answer a question.

Scoring the test:

The scores of the test as a whole ranged from zero as the minimum to 50 as the maximum. The student gets two scores for each question if he answers correctly to the both parts. However, if he answers the first part correctly and the second part inaccurately, he gets one score. If the answer for the first part is incorrect but correct for the second part, he gets nothing. He also gets nothing if he answers both parts inaccurately. This is because the first part of the question identifies the scientific concept to be acquired by the student accurately. Therefore, this part receives a great importance while the second part gives an interpretation for the student's choice of the scientific concept.

Test validity:

The test was submitted to a panel of professors specialized in curricula and methods of teaching Science and experienced

supervisors and teachers of Chemistry. Some of the items and/or options were modified in light of the opinions that the final form of the test included 25 items.

The pilot study:

The first version of the test was administered to a sample of students from Abdelmonem Wasel Secondary School at New Cairo Directorate (n=50). Reliability coefficient was calculated using Pearson Split- Half method. The reliability coefficient was 0.82 which indicates a high degree of reliability and that it is ready for use. The time needed for the test was calculated and was found to be 50 minutes.

In the light of the previous results, the test in its final form consists of 25 items, 20 of them are distributed to the 10 concepts in addition to five questions distributed to the relationship between each two of the 10 concepts as Table 2 shows.

Table 2: Specifications of the diagnostic test

Item concepts	Number	Total	Relative weight
System	12:1	2	8%
The thermochemistry equation	13:2	2	8%
Exothermic reaction	14:3	2	8%
Endothermic reaction	15:4	2	8%
Enthalpy	16:5	2	8%
Heat capacity	17:22	2	8%
Heat of solution	24:7	2	8%
Dilution heat	19:8	2	8%
Combustion heat	20:9	2	8%
Formation heat	21:10	2	8%
The relationship between the concepts	6:11:18:23:25	5	20%
Total		25	100%

Thus, the test became in its final form (Appendix 5) ready for use. Results gained from the test can be trusted.

Scale of achievement motivation:

A scale of achievement motivation for the secondary stage students was prepared as follows:

Identifying the aim of the scale of achievement motivation:

This scale aims at assessing achievement motivation to identify the effectiveness of the reframing strategy based on NLP in developing achievement motivation in Chemistry among a sample of low achievers at the first grade of the secondary stage.

Identifying the dimensions of the scale:

A group of achievement motivation scales such as Hermans' translated by Abdelfattah (2002), Barakat (2000) and Abdelaziz (2013) were reviewed. The dimensions of the scale were identified based on high frequency of dimension in the literature and previous studies. Three dimensions were identified: taking the responsibility, competition and desire for excellence and self-confidence and respect.

- a. **Identifying the kind of the scale items and formulating them:** The items of the scale were formulated as situations the students face. The response was selected from a five-point Lickert scale (strongly agree, agree, don't know, don't agree and strongly don't agree). The students have to choose the response that matches their own opinions. The scale consisted of 30 items with 10 items for each dimension in the scale. Twenty items are positive while 10 are negative.
- b. **Writing the instructions of the scale:** The instructions of the scale were written in clear language that makes it easy for the student to answer. It also included an illustrative example to help the student.
- c. **Validity of the scale:** the scale was submitted to a panel of jurors for checking validity of the items, their preciseness, comprehensiveness and suitability for the intended dimensions of the scale, appropriateness of the language to the secondary stage students. The jurors gave their opinions and the scale was modified in the light of their opinions.
- d. **Piloting the scale:** The scale in its first form was administered to a sample of 20 secondary stage first year

graders at Abdelmonem Wasel Secondary School, New Cairo Directorate in order to:

- Assess the scale's reliability: Scale reliability was calculated using Kudor Richardson equation. The reliability coefficient was 0.83 which is an acceptable one. Thus, the scale is applicable.
- Duration of the scale: The average time for all the students to finish responding to all the items of the scale was 30 minutes.
- Scoring the scale: The positive statements are given five scores for "strongly agree", four for "agree", three for "neutral", two for "don't agree" and one for "strongly don't agree". Scoring is reversed for the negative items. Thus, the total score for the scale was 150 scores.

The final version of the scale:

After making the required modifications, the final version of the scale of achievement motivation was prepared. Specifications are presented in Table 3.

Table 3: Specifications of the scale of achievement motivation

No.	Dimension	Positive items	Negative items	Total
1	Taking the responsibility	1·4·7·10·13·16·19	21·24·27	10
2	Competition and desire for excellence	2·5·8·11·14·17·20	22·25·28·30	10
3	Self-confidence and esteem	3·6·9·12·15·18	23·26·29	10
Total		20	10	30

Thus, the scale in its final form (Appendix 6) consists of 30 items each of which is scored on a five- point Lickert scale. The total score of the scale is 150.

The study:

1. Selecting the population of the study.

The study population was general education secondary stage first graders. Two samples of the first graders were selected: The first sample was diagnostic to diagnose and

identify the alternative conceptions about the scientific concepts and the natural phenomena in the thermochemistry unit most frequent and common among the students. The diagnostic sample consisted of 50 students randomly chosen from Abdelmonem Wasel Secondary/ Prep School and Abdelwahab Mutawe Secondary/ Prep School who responded completely to the test of alternative conceptions from six classes randomly selected from the two schools which finished studying the thermochemistry unit by the end of the second semester 2013/ 2014.

The second group is experimental. Two secondary schools at New Cairo Directorate: Abdelmonem Wasel Secondary/ Prep School to represent the experimental group (n=29 students) and Abdelwahab Mutawe Secondary/ Prep School to represent the control group (n=32 students) who got less than 60% of the midterm exam carried out by the school by the end of the first term 2014/ 2015. Table 4 presents information on the sample of the study.

Table 4: Specifications of the sample of the study

Group	Directorate	Class	No.
Experimental: Abdel monem Wasel Secondary/ Prep School for boys	New Cairo	3/1	29
Control: Abdelwahab Mutawe Secondary/ Prep School	New Cairo	1/1	32
Total	61		

Pre-administration of the instruments:

The instruments of the study (the achievement test, the diagnostic test and scale of achievement motivation) were administered to the experimental and the control groups before teaching the unit from 16/11/2014 to 18/11/2014 to get data related to homogeneity of the groups. Table 5 presents data on the results of the pre-administration of the instruments.

Table 5: Results of the pre-administration of the study instruments to the experimental and the control groups and mean scores, SD, t-value and its significance

Test	Total score	The experimental group (n=29)		The control group (n=32)		t-value	Sig. 0.01
		Mean	SD	Mean	SD		
The achievement test	30	0.48	0.63	0.37	0.49	0.74	Not sig.
The diagnostic test	50	0.17	0.38	0.15	0.36	0.17	Not sig
Scale of achievement motivation	150	37.38	4.73	38.2	4.3	0.72	Not sig

The previous table shows that there were no statistically significant differences at the 0.05 level between the mean scores of the experimental and the control groups in the pre-administration of the study instruments (the achievement test, the diagnostic test and the scale of achievement motivation). This indicates that the two groups were homogeneous before conducting the experiment.

2. Teaching the experimental group:

The class teacher was asked to teach the experimental group. The class teacher was trained before conducting the experiment where the researcher explained the aim of the study, its importance, the philosophy on which it is based and the procedures of teaching using the reframing strategy based on NLP as explained in the teacher's guide. The teacher was provided with some worksheets of the activities related to the stages of the reframing strategy. This required that the teacher:

- Focuses on the stages of the reframing strategy (identifying the frame of the concept's prior conceptions, increasing motivation for changing the old frame, introducing the new frame – forming a new frame suitable for the correct conception and widening the correct conception).

- Identifies the frame of the concept's prior conceptions by introducing activities for the students that help them to predict, observe and interpret. These activities help identifying the frame which will help forming the alternative conception.
- Focuses on helping each student to form their portfolios one by one and encourages them to reflect on their work and rationales for adding them to the portfolios.
- Increases the students' motivation and attention to change the alternative conception's old frame by introducing conflicting events so that a cognitive conflict is formed. This conflict contributes at the beginning of changing the old frame accompanying the alternative conception and introduces evidences on the incorrectness of the alternative conception.
- Introduces and explains the new conception using active learning strategies.
- Forms the new frame of the new concept by using analogies and metaphors identifying the similarities.
- Helps the students, at the deepening stage of the concept, to generate different kinds of relations as a way for understanding Science through the relationships between the newly learnt concepts and the concepts previously learnt and the values, beliefs and experiences related to them through concept maps, diagrams, figures, drawings, demonstrations, etc...
- Uses the teacher's guide and widens his background knowledge from different resources.
- Encourages the students to use the student's book and deal with it as worksheets to be kept by the students which help the teacher to examine and follow the students' progress.
- Encourages the students to answer the exercises that measure learning outcomes of thermochemistry at the end of each lesson.

Teaching the unit “Thermochemistry” started in the first term on Sunday 23rd November, 2014 and ended on Thursday 18th December, 2014. The control group was taught the same content of the unit for the same period of time using the traditional method.

3. Post- application of the instruments of the study

After the experiment, the achievement test, diagnostic test and scale of achievement motivation were administered to the experimental and the control groups from 21/12/2014 to 24/12/2014. They were scored and data was statistically treated.

4. Statistical analyses used

- Non-paired samples t-test was used to identify significance of the differences between the mean scores of the students in the experimental and the control groups in the achievement test, the diagnostic test and the scale of achievement motivation.
- Paired samples t-test was used to identify the significance of the differences between the mean scores of the pre-post scores on the achievement test, the diagnostic test and the scale of achievement motivation of the experimental group
- Eita square (η^2) was calculated and the effect size (d) was estimated (Kieess, 1989: 446).
- Black’s Gain Ratio was used to measure the effectiveness of using the reframing strategy based on NLP principles in developing achievement and achievement motivation and modifying alternative conceptions among secondary stage low achievers (Allam, 2000: 75).

Results of the study and their interpretations

This section presents results of the study concerning its four questions and the hypotheses related to them as follows:

The first question: What are the alternative conceptions about thermochemistry concepts common among the low achievers at the first grade of the secondary stage?

To answer this question, test of alternative conceptions was administered to the diagnostic sample. Percentages of the frequencies of alternative conceptions more than 20% were calculated. Table 6 shows these results.

Table 6: Most common alternative conceptions about thermochemistry concepts

Concept System	Alternative conception	Frequency	Percentage
	The part surrounding reaction	15	30%
	The open system is the one that doesn't allow transfer of energy or matter between the system and the medium	20	40%
	The isolated system is the one that allows transfer of energy or matter between the system and the medium	20	40%
	The closed system is the one that doesn't allow exchange of energy between the system and the surrounding medium	20	40%
	The glass in which reaction takes place.	20	40%
	In the open system, the total energy remains stable even if the system changes from one state to another.	12	24%
The chemical equation	Is the one that is not related to the law of conservation of energy	22	44%
	An equation that should not necessarily be weighted	32	64%
	A weighted equation that shows the thermo change regardless of the state of the matter.	38	76%
	It is like the chemical reaction equation	30	60%
	In which thermo change is not affected by the state of the reactants and the outputs.	40	80%
Exothermic reactions	That in which ΔH is positive.	30	60%
	That in which the energy of reactants is less than that of the output's.	31	62%
	That is accompanied by flame.	25	50%
	It is the same as heat of combustion.	17	34%
	Its plan of energy shows that the results are higher than zero.	31	62%
	In which heat transfers from the surrounding medium to the system.	16	32%
	Doesn't follow the thermodynamic law.	24	48%
	Reactions that do not happen spontaneously.	17	34%
Endothermic reactions	In which ΔH is negative.	20	40%
	Accompanied by decrease of heat that can be felt by touch.	29	58%
	Omission of the enthalpy for the maximum value from that of the minimum value.	35	70%
	In which the energy of reactants is more than that of the results.	2	42%
	In which plan of energy shows that the results are less than zero.	16	32%
	Heat transfers from the medium to the system.	26	52%
	Doesn't follow the law of thermodynamics.	15	30%
Enthalpy	Reactions that happen spontaneously.	25	50%
	The total of the potential energies in the mass of the matter.	39	78%

	Different from thermo enthalpy.	32	64%
	Similar in the different matters.	17	34%
	Easy to measure while thermo-change is difficult to measure.	24	48%
	Stored in the atom as energy of bonds.	23	46%
	Stored in the molecule as Vander-Val electrostatic forces	16	32%
	For the element more than the molecule's enthalpy in the compound	23	64%
	Doesn't contribute in the calculation of enthalpy	13	26%
Heat capacity	The heat required for increasing the temperature of one gram of the substance one percentage.	30	60%
	Different materials have the same heat capacity	16	32%
	The heat required for increasing the temperature of one mole of the substance one percentage.	35	70%
	The more the mass of the pot that contains the substance, the less the heat capacity.	30	60%
Heat of solution	The amount of heat released or absorbed when dissolving one mole of the dissolved in a specific amount of the solvent	32	64%
	The change in heat resulting from dissolving one mole of the dissolved to form one liter of the solution	27	54%
	The heat resulting from attaching the matter to the molecules of the substance	21	42%
	The amount of heat released or absorbed when dissolving any amount of the substance in water	20	40%
	That is accompanied by release of heat because of breaking the bonds in the results.	18	36%
	It is the same for the aqua materials and non-aqua materials.	29	58%
Dilution heat	The heat resulting from dissolving a solid substance in water.	16	32%
	The heat resulting from adding any amount of water to the solution.	12	42%
	The heat released for each mole of the dissolved when diluting the solution	34	68%
	The heat absorbed for each mole of the dissolved when diluting the solution	34	68%
	The heat released or absorbed for any amount of the dissolved when diluting the solution	23	46%
	The heat resulting from removing the ions away from each other	19	38%
	The heat absorbed as a result of linking molecules of the dissolved to the ions	16	32%
	The heat released or absorbed for each mole of the dissolved when diluting the solution	40	80%
Combustion heat	The heat resulting from burning any amount of a substance in oxygen.	25	50%
	Is the heat in which HA is positive in the equation.	15	30%
	It is the same amount of heat resulting from the caloric value.	40	80%
	The amount of heat resulting from the combination of the substance with a limited amount of oxygen.	35	70%
	The amount of heat resulting from the combination of one mole of the substance with a great amount of hydrogen.	41	82%

	Happens in the reactions which combine with oxygen and are not accompanied by release of heat or light.	16	32%
Heat of formation	The amount of heat released when forming an amount of a substance.	26	52%
	It is the one calculated directly in all cases.	21	42%
	For one mole of CO, it can be calculated through the combination of oxygen and carbon.	41	82%
	It is the same as heat of combustion for all substances.	21	42%
	The more it increases, the less stable the compound will be.	24	84%
	It can be measured regardless the measuring state of the reactants and the results.	39	78%

It is clear from the above table that there are alternative conceptions whose frequency among the diagnostic sample reached more than 20% and ranged from 80% as a maximum to 22 as a minimum.

The second question: What is the effectiveness of using reframing strategy based on NLP in modifying thermochemistry alternative conceptions among low achievers at the first grade of the secondary stage?

To answer this question, the validity of the first and second hypotheses were checked, effect size was calculated as well as Black's Modified Gain Ratio. The results are as follows:

Checking the validity of the first hypothesis:

"There is a statistically significant difference between the mean scores of the experimental and the control groups in the post administration of the diagnostic test as a whole and all its dimensions in favor of the experimental group". To verify the validity of this hypothesis, mean scores and standard deviations for the scores of the experimental and the control groups in the post administration of the diagnostic test in addition to t-value for non-paired groups were calculated. Table 7 presents these results.

Table 7: Mean scores, standard deviation and t-value for the post administration of the diagnostic test to the experimental and the control groups

Variable	Group	No.	Mean	SD	Degree of freedom	T-value	Sig	η^2	Effect size d
Modifying alternative conceptions	Ex.	29	32,9	4,78	59	19,61	Sig	0,87	5,17
	Cont.	32	15,31	1,6					

It is clear from Table 7 that there is a statistically significant difference at the 0.01 level between the mean scores of the experimental and the control groups in the post administration of the diagnostic test in favor of the experimental group. T-value was 19.61 which is significant at the 0.01 level. Effect size was more than 0.8 which indicates a great effect of the reframing strategy based on NLP on modifying alternative conceptions among low achievers at the first grade of the secondary stage. Thus, the first hypothesis is accepted.

Checking the validity of the second hypothesis:

The second hypothesis of the study states “There is a statistically significant difference between the mean scores of the experimental group on the pre-post diagnostic test as a whole and its dimensions in favor of the post administration. To check the validity of this hypothesis, mean scores, standard deviations for the experimental group’s pre- post scores on the diagnostic test, and t-value for paired groups were calculated. Table 8 presents these results.

Table 8: Mean scores, standard deviation and t-value for experimental group’s scores on the pre-post administration of the diagnostic test

Variable	Test	No.	Mean	SD	T-value	Sig	η^2	Effect size d
The diagnostic test	Post-	29	32.9	4.7	19.61	Sig	0.98	9.89
	Pre-	32	0.17	0.38				

It is clear from Table 8 that there is a statistically significant difference at the 0.01 level between the mean scores of the experimental group on the pre-post diagnostic test of alternative conceptions in favor of the post- test. T- value was 36.75 which is significant at the 0.01 level. The effect size was more than 0.8 which indicates a great effect of the reframing strategy based on NLP in modifying alternative conceptions among first year low achievers at the secondary stage. Thus, the second hypothesis is accepted.

To find out the effectiveness of the reframing strategy based on NLP principles, Black's Modified Gain Ration was calculated. Table 9 shows this information.

Table 9: Mean scores of the experimental and the control groups in the pre-post diagnostic test and the Modified Gain Ratio

Test	Maximum score	Mean score (pre-)	Mean score (post)	Gain ratio
The diagnostic test	52	0.17	32.9	1.27

It is clear from Table 9 that Black's Modified Gain Ratio for the diagnostic test is more than the minimum identified by Black (1.2) which indicates the effectiveness of the reframing strategy based on NLP principles in modifying alternative conceptions in thermochemistry among low achievers at the first grade of the secondary stage.

The third question: What is the effectiveness of using the reframing strategy based on NLP in developing achievement in Chemistry among low achievers at the first grade of the secondary stage?

To answer this question, the validity of the third and fourth hypotheses were checked and effect size and Modified Gain Ratio were calculated as follows:

Checking the validity of the third hypothesis:

The third hypothesis of the study states "There is a statistically significant difference between the mean scores of the experimental and the control groups in the achievement test as a whole and all its dimensions in favor of the experimental group". To check the validity of this hypothesis, mean scores, standard deviations for the achievement post- test of the experimental and control groups in addition to t- value for non-paired groups were calculated. Table 10 gives results of this hypothesis.

It is clear from Table 10 that there is a statistically significant difference at the 0.01 level between the mean scores of the experimental and the control groups in the post administration of the achievement test in favor of the

experimental group. The highest T-value was 7.74 for the comprehension dimension whereas the lowest was 3.73 for the application dimension which is significant at the 0.01 level. Effect size was more than 0.8 in the test's dimensions and the test as a whole which indicates a great effect of the reframing strategy based on NLP on developing achievement among low achievers at the first grade of the secondary stage. Thus, the third hypothesis is accepted.

Table 10: Mean scores, standard deviation and t-value for the post administration of the achievement test to the experimental and the control groups

The achievement test	Total score	Ex. group		Cont. group		T-value	Sig	η^2	Effect size D
		Mean	SD	Mean	SD				
Knowledge	6	4.06	0.99	3.21	0.42	4.4	Sig.	0.25	1.16
Comprehension	15	9.6	1.56	7	.04	7.74	Sig.	0.51	2.04
Application	9	5.5	1.4	4.53	0.63	3.73	Sig.	0.19	0.97
Total	30	19.6	4.3	14.74	1.83	4.97	Sig.	0.29	1.2

Checking the validity of the fourth hypothesis

The fourth hypothesis states "There is a statistically significant difference between the mean scores of the experimental group's pre-post achievement tests as a whole and its dimensions in favor of the post- test". To check the validity of this hypothesis, mean scores, standard deviations for the experimental group's pre- post scores on the achievement test, and t-value for paired groups were calculated. Table 11 presents these results.

Table 11: Mean scores, standard deviation and t-value for experimental group's scores on the pre-post administration of the achievement test

The achievement test	Total score	Pre-		Post-		t-value	Sig 0.01	η^2	Effect size d
		Mean	SD	Mean	SD				
Knowledge	6	0.34	0.48	4.57	0.99	9.44	Sig.	0.93	7.28
Comprehension	15	0.2	0.41	9.6	1.56	33.7	Sig.	0.97	7.28
Application	9	0.01	0.01	5.5	1.4	21.3	Sig.	0.94	7.9
Total	30	0.55	0.63	19.67	3.66	9.99	Sig.	0.97	11.37

It is clear from Table 11 that there is a statistically significant difference at the 0.01 level between the mean scores

of the experimental group on the pre-post achievement test in favor of the post- test. The highest T- value was 29.99 for the total score of achievement and the lowest was 19.44 for the remembering dimension which are significant at the 0.01 level. The effect size was more than 0.8 for the whole test and the three dimensions which indicate a great effect of the reframing strategy based on NLP in developing achievement among first year low achievers at the secondary stage. Thus, the fourth hypothesis is accepted.

To find out the effectiveness of the reframing strategy based on NLP principles, Black's Modified Gain Ratio (Allam, 2000) was calculated. Table 12 shows this information.

Table 12: Mean scores of the experimental and the control groups in the pre-post achievement test and the Modified Gain Ratio

Dimensions of test of scientific concepts	Maximum score	Mean score (pre-)	Mean score (post)	Gain ratio
Knowledge	6	0.34	4.57	1.57
Comprehension	15	0.2	9.6	1.29
Application	9	0.01	5.5	1.23
Total	30	0.55	19.67	1.32

It is clear from Table 12 that Black's Modified Gain Ratio for the achievement test as a whole and for its dimensions are more than the minimum identified by Black (1.2) which indicate the effectiveness of the reframing strategy based on NLP principles in developing achievement among low achievers at the first grade of the secondary stage.

The fourth question: What is the effectiveness of using reframing strategy based on NLP in developing achievement motivation among low achievers at the first grade of the secondary stage? To answer this question, the validity of the fifth and sixth hypotheses were checked, effect size and Modified Gain Ratio were calculated as follows:

Checking the validity of the third hypothesis:

The fifth hypothesis of the study states "There is a statistically significant difference between the mean scores of the experimental and the control groups in the scale of achievement

motivation as a whole and all its dimensions in favor of the experimental group". To check the validity of this hypothesis, mean scores, standard deviations for the achievement motivation scale of the experimental and control groups in addition to t-value for non-paired groups were calculated. Table 13 gives results of this hypothesis.

Table 13: Mean scores, standard deviation and t-value for the post administration of the scale of achievement motivation to the experimental and the control groups

Dimensions of achievement motivation	Total score	Ex. group		Cont. group		T-value	Sig. 0.01	η^2	Effect size D
		Mean	SD	Mean	SD				
Taking the responsibility	50	35.06	4.36	17.71	4.09	6.18	Sig.	0.82	4.26
Competition and desire of excellence	50	33.65	4.54	16.84	2.74	7.67	Sig.	0.84	4.58
Self-confidence and esteem	50	30.68	2.62	15.97	2.56	22.17	Sig.	0.89	5.68
Total	150	99.39	8.92	50.52	6.87	24.09	Sig.	0.91	6.36

It is clear from Table 13 that there is a statistically significant difference at the 0.01 level between the mean scores of the experimental and the control groups in the post administration of the achievement motivation scale in favor of the experimental group. The highest T-value was 24.09 for the scale as a whole whereas the lowest was 16.18 for the dimension of taking the responsibility which are significant at the 0.01 level. Effect size was more than 0.8 in the scale's dimensions and the scale as a whole which indicate a great effect of the reframing strategy based on NLP on developing achievement motivation among low achievers at the first grade of the secondary stage. Thus, the fifth hypothesis is accepted.

Checking the validity of the sixth hypothesis:

The sixth hypothesis states "There is a statistical significant difference between the experimental group's mean scores in the pre-post scale of achievement motivation as a whole and its dimensions in favor of the post administration". To check the validity of this hypothesis, mean scores, standard deviations for

the experimental group's pre- post scores on the achievement motivation scale, and t-value for paired groups were calculated. Table 14 presents these results.

Table 14: Mean scores, standard deviation and t-value for experimental group's scores on the pre-post administration of the achievement motivation scale

Dimensions of achievement motivation	Total score	Pre-		Post-		t-value	Sig. 0.01	η^2	Effect size d
		Mean	SD	Mean	SD				
Taking the responsibility	50	4.48	2.87	35.06	35.06	18.36	Sig.	0.92	6.78
Competition and desire of excellence	50	2.03	1.47	33.6	4.54	23.57	sig.	0.95	8.71
Self-confidence and esteem	50	0.86	0.95	30.69	2.62	39.94	Sig.	0.96	9.79
Total	150	37.37	4.73	99.35	8.92	31.96	Sig.	0.97	11.37

It is clear from the results of Table 14 that there is a statistically significant difference at the 0.01 level between the mean scores of the experimental group on the pre-post achievement motivation scale in favor of the post. The highest T-value was 39.94 for the self- confidence and esteem, and the lowest was 18.36 for the taking the responsibility dimension which are significant at the 0.01 level. The effect size was more than 0.8 for the whole scale and the three dimensions which indicate a great effect of the reframing strategy based on NLP in developing achievement motivation among first year low achievers at the secondary stage. Thus, the fourth hypothesis is accepted.

To find out the effectiveness of the reframing strategy based on NLP principles, Black's Modified Gain Ratio (Allam, 2000) was calculated. Table 15 shows this information.

It is clear from Table 15 that Black's Modified Gain Ratios for the dimensions of the scale of achievement motivation and the whole scale are more than the minimum identified by Black (1.2) which indicate the effectiveness of the reframing strategy based on NLP principles in developing achievement motivation among low achievers at the first grade of the secondary stage.

Table 15: The experimental group's mean score in the pre-post scale of achievement motivation and the Modified Gain Ratio

Achievement motivation	Maximum score	Mean score (pre-	Mean score (post)	Gain ratio
Taking the responsibility	50	14.48	35.06	1.57
Competition and desire for excellence	50	12.3	33.6	1.48
Self-confidence and esteem	50	10.86	30.69	1.33
Total	150	37.37	99.35	1.46

Interpretation and discussion of the results:

1. **Interpreting the results related to the alternative conceptions in concepts of thermochemistry:** Results of the first question indicates that there are alternative conceptions for the concepts in thermochemistry that reaches more than 20% of the diagnostic sample. The percentages ranged from 80% to 22% which is a big one that indicates a clear weakness among the students in the correct scientific understanding of the concepts of thermochemistry. This may be the main reason for low achievement. This result agrees with Abdou (2000), Albaz (2007), Sakr (2004) and Sadeque (2004). The researcher believes that the existence of a big percentage of alternative conceptions in thermochemistry may be that the connotations of the chemical concepts are unclear because of using traditional methods of teaching and the absence of the scientific dimension in teaching Chemistry, not to mention using traditional methods of evaluation that focus on memorization and the low levels of the cognitive levels in addition to not giving the students opportunities for practicing thinking and analysis. The researcher believes that knowledge should not be limited to one source, and teaching should not be limited to memorizing the chemical concepts without their connotations. Besides, practicing the experimental method and thinking skills during teaching and learning

Chemistry may decrease the chemical alternative conceptions in the students' minds.

2. Interpreting the results related to modifying alternative conceptions: Results of the first and second hypotheses showed significant statistical differences between the mean scores of the experimental and the control groups in the diagnostic test in favor of the experimental group. In addition, there was a statistical significant difference between the mean scores of the experimental group's scores in the pre-post diagnostic test in favor of the post. However, in the light of the scientific connotation, these differences do not necessarily mean the effectiveness for using the reframing strategy based on NLP in modifying alternative conceptions. Therefore, effect size was calculated. Its value was more than 0.8 in the results of the first and second hypotheses which indicate a great educational important effect of the reframing strategy based on NLP in modifying alternative conceptions of the thermochemistry concepts among first grade secondary stage low achievers. Besides, results of applying Black's Modified Gain ratio indicated that the ratio is more than the minimum identified by Black (2.1) which shows the effectiveness of the reframing strategy based on NLP in modifying alternative conceptions of the thermochemistry concepts among low achievers at the first grade of the secondary stage. These results are consistent with Sabry and Abderrady (2010), Alkhalily (1996) Emam (2011) and Hewson and Hewson (2003). The researcher believes that the effectiveness of the reframing strategy based on NLP in modifying alternative conceptions in thermochemistry concepts among low achievers may be due to the nature of the strategy which depends on the constructivist theory in paying attention to the students' prior knowledge about the concept. This is represented in the first step of the strategy, identifying ideas related to alternative conceptions of the concept. In addition, the reframing strategy is considered a comprehensive

strategy that includes in its steps many strategies for modifying alternative conceptions such as increasing motivation which depends on cognitive conflict theory. The second step, i.e. introducing the new concept relates to the constructivist model. The fourth step of the strategy, i.e. forming a suitable frame for the correct concept relates to the analogy strategy for modifying alternative conceptions. The fifth step, i.e. widening the concept relates to metacognitive strategies which help the students to form their cognitive structure correctly and achieve growth in knowledge.

3. Interpreting the results related to achievement: Results of the third and fourth hypotheses revealed statistically significant differences between the mean scores of the experimental and the control groups in the achievement test in favor of the experimental group. In addition, there was a statistically significant difference between the mean scores in the experimental groups' pre-post achievement test in favor of the post test. However, in the light of the scientific connotation, these differences do not necessarily mean the effectiveness for using the reframing strategy based on NLP in developing achievement. Therefore, effect size was calculated. Its value was more than 0.8 in the results of the third and fourth hypotheses which indicate a great educational important effect of the reframing strategy based on NLP in developing achievement among first grade secondary stage low achievers. Besides, results of applying Black's Modified Gain ratio indicated that the ratio is more than the minimum identified by Black (2.1) which shows the effectiveness of the reframing strategy based on NLP in developing achievement among low achievers at the first grade of the secondary stage. These results are consistent with Emam (2011) and Blackerby (2002). The researcher believes that the effectiveness of the reframing strategy may be because it helps diagnose alternative conceptions in thermochemistry. Consequently, it helps correct

comprehension of the thermochemistry concepts and provides the students with an atmosphere of freedom in which they present their ideas without fear or shame. They also have the chance to present the cognitive conflict around the concepts which helps interaction among them. The strategy's dependence on forming a new frame for the concepts through presenting analogies helps the students to retain the concepts, know their connotations and continue in learning the chemical concepts. In addition, the strategy's dependence on the learners' activity and constructing knowledge by themselves makes them the core of the educational process through the next step of the strategy which is introducing concepts through discussion, dialogue and focus groups.

4. Interpreting the results related to achievement motivation : Results of the fifth and sixth hypotheses revealed statistically significant differences between the mean scores of the experimental and the control groups in the achievement motivation scale in favor of the experimental group. In addition, there was a statistically significant difference between the mean scores in the experimental groups' pre-post achievement motivation scale in favor of the post test. However, in the light of the scientific connotation, these differences do not necessarily mean the effectiveness for using the reframing strategy based on NLP in developing achievement motivation. Therefore, effect size was calculated. Its value was more than 0.8 in the results of the fifth and sixth hypotheses which indicate a great educational important effect of the reframing strategy based on NLP in developing achievement motivation among first grade secondary stage low achievers. Besides, results of applying Black's Modified Gain ratio indicated that the ratio is more than the minimum identified by Black (2.1) which shows the effectiveness of the reframing strategy based on NLP in developing achievement motivation among low achievers at the first grade of the secondary stage. These results are

consistent with Alsafy (2000), Shehata (2010) and Nelon (2003). The researcher believes that the effectiveness of the reframing strategy in developing achievement motivation may due to the nature of the strategy and its steps. The second step is increasing motivation for changing the old frame through cognitive conflict which would lead to increasing motivation. Helping the students to correct their alternative conceptions for thermochemistry concepts helps them to get higher scores in the Chemistry tests which, in turn, increases motivation towards learning Chemistry and desire for more learning of chemistry concepts, not to mention the relaxing atmosphere of learning, respect for each learner and his capabilities and acknowledging individual differences in a way consistent with NLP principles such as respecting and accepting the others, the map is not the territory, and everyone has levels of conscious and subconscious communication. The strategy's encouragement of deepening the concept encourages the students for more learning and increases motivation for learning.

Recommendations:

- Diagnostic tests should be prepared for finding out different patterns of scientific alternative conceptions among the Chemistry learners at different educational stages, and making use of their results when reviewing the Chemistry courses for those educational stages concerning the scientific content and the accompanying figures.
- Teacher's guide should include a part on diagnosing the students' alternative conceptions and suggestions for tackling them correctly.
- Reframing strategy and the principles of NLP should be included in the Teacher's Guide of the Chemistry course.
- In-service teachers should be trained on how to diagnose alternative conceptions among the students and how to make use of the reframing strategy based on NLP in

modifying alternative conceptions in helping the students to acquire the correct scientific concepts and correct the alternative ones.

- Caring for the low achievers at the secondary stage by using a strategy that helps the students to modify their alternative conceptions, changing them from negative to positive active participants during the learning process.

Suggestions for further research:

- The effectiveness of a suggested unit in Chemistry based on the principles of NLP in correcting alternative conceptions in Chemistry and achievement among the secondary stage students.
- The effectiveness of a training program for developing teachers' skills in using the reframing strategy based on NLP in modifying alternative conceptions in thermochemistry among the secondary stage students.
- Developing the Chemistry curricula at the secondary stage in light of alternative conceptions in Chemistry and achievement motivation.
- The effect of NLP in teaching Chemistry and developing achievement and achievement motivation among secondary stage students.

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