LILIA BENÍTEZ CORONA & REYNA DEL CARMEN MARTÍNEZ RODRÍGUEZ

RESILIENT COMPETENCIES IN THE COMPREHENSIVE EDUCATIONAL TRAINING FOR ENGINEERING STUDENTS

Abstract

This paper presents part of the research results: "The development of resilient competencies through protective factors and risk in engineering students". Resilience is considered as a process, a becoming human that inscribes its development in an environment and writes its story in a culture (Jaramillo, 2004: 231). So Vanistendael (2006) identifies resilience as the competence to facing problems and to emerge stronger. The methodology used in the study was of mixed cut, significant results were rescued to find elements such as: Recognition, sense of life and positive interaction that impact on the comprehensive educational training of engineering student facing continuous changes caused by globalization.

Development

The Education in the XXI Century demands tasks that are not only to provide knowledge to individuals but also to give them a comprehensive education that prepare them for life, learning skills, attitudes and values that allow them to adapt to any context where they are.

In this sense the educational reform most important that permeates to the technological higher education in Mexico is a model based on competencies. This is observed in the curricula, because each subject has a specific objective that it has the purpose to develop a particular skill that responds to the needs of different sectors. This model emerged in Europe through the "Turning" project and, later, the Organization for Economic Cooperation and Development (OECD) as an international promoter to improve educational services has promoted researches that demonstrate the need for comprehensive training in the development of knowledge, skills and attitudes.

The origin of the word "competency" comes from the Greek words *agon* and *agonistes,* which mean in the Greek theatre "The protagonist", the main character around which the story goes. This reference is considered to identify and strengthen the concept of education focused on construction and reconstruction skills, and gives the feeling of training protagonist in knowledge community (Gallego, 1999).

Different perspectives have emerged about competencies; Chomsky (1954), who attributes the origin of them to cognitive activity, and defines it as the ability and willingness to realize the activities requested, as these also have an attitudinal character, that´s why at the same time they are cognitive, affective, conative, intentional and behavioural.

By the above idea, it is assumed that competency, although it is generated from the learning , this does not develop it by itself, needs others, so a very important element arises: interaction, such as it is mentioned by Ausubel et al. (1983: 56), quoting: "Whoever learns, builds actively with others its own concepts, categories and notions".

In this regard, the contributions of Perrenound (2011) mention that in education field competency is considered as the ability to acting effectively, as it relies on knowledge but it is not limited to them, because they take into account attitudes, skills and values in the integral formation of the individual.

In engineering is being looking for incorporate concepts from different disciplines to student thinking, get the appropriation by the students and thereby achieve significant learning that help them in their decision-making throughout their lives and obtain that the learning is not momentary, only to "pass" a subject.

An efficient engineer, in addition to knowledge and skills acititudes that has applied and reflected in the results (Lopez & Valenti, 2005, p. 56).They are present values in technology education that should not be neglected. In the current world, where the technology has acquired an extraordinary relevance, there are other values that should also be present in education of engineers in order to make them adapted to their professional time. The idea is educate to innovate and educate to participate.

Consequently, comprehensive educational training in engineering is directed to prepare professionals involved in the technological innovation, the synergistic work and critical, autonomous and reflexive thinking, necessary to apply it in different contexts.

Due to the above in the sociocultural paradigm of Vigotsky (1986) argues that the relationship between subject and object of knowledge is not a bipolar relationship as in other paradigms, it becomes an open triangle of three vertices: subject and object of knowledge and the sociocultural instruments. Thus the influence of cultural context plays an essential roll in the development of the subject, who is influenced not passively but actively reconstructed. Within the resilience approach, sociocultural part mentioned by Vygotsky is part of the importance of interpersonal relations of the subject and also that resilience is an interaction process where the family interferes, in this case the environment in the university experienced by the individual.

In this sense, the conscious esteem, considered as a protective factor, not only depends on the acceptance of others, but also of personal achievements (Vanistendael & Lecomte, 2006). This gives guideline to open a wider domain of competencies and skills; they are perhaps the most visible part of resilience to the point that causes confusion.

In resilience, the competency term is underlined in a very broad sense as human, social and professional skills. Vanistendael (2006) argues that in order to facilitate acquisition of skills to the individual the following conditions are needed: climate of trust, participation in different activities that allow him to learn, provide the tools to do his job, offer encouragement, avoiding the idea of failure and turning it into a new opportunity for learning.

Therefore, the resilient competencies depend on several factors related not only to the individual but also their environment, past, present and social interaction. Also, do not forget that resilience is not a characteristic of the individual in a strict sense, but the person in the interaction with the surrounding human environment. In the university environment there are elements involved in the comprehensive education training and they are strengthened by certain skills such as recognition, the meaning of life and positive interaction.

Methodology

In the first stage a questionnaire was applied to identify resilient characteristics in 105 students of which 14 were selected. That is why the sample has 2 women and 12 men aged between 19 and 21 years. In the second part the qualitative method was used for the hermeneutic analysis of their life histories. The hermeneutics approach allows a broader perspective towards individual in a holistic way, because emerge a comparison between the simultaneous crosslinking of various temporalities in a given situation from the text and context (Velez & Galeano, 2000).

Consequently, in the educational field life story as research's modality is considered as a conceptual support of methods of work, technics and tools of analysis (Bolivar, Domingo & Fernandez, 2001).

People build their story through their culture, customs, sex, class and ethnicity, among others, observed thus a complex social reality in motion, making it necessary to identify their transformation processes (Cifuentes, 2011).

From the perspective of hermeneutics approach and contributions of resilience identified by Vanistendael (2006), the life stories of students were analysed because they elaborated their experiences in childhood, adolescence and youth.

This allows us infer how they founded their resilience through protective and risk factors, at the same time we identified who accompanied them in their development. This is how it weaves resilience: not to be found only in the interiority of the person nor in their environment, but between both, because there is an intimate process to the social environment (Cyrulnik, 2006).

The research was conducted in three stages: The first was the meeting where the main points were explained to make life stories. The second rescued those items that corroborated that students are resilient, it is considered in four points: problem identification, facing and solving problem, resilient tutor and reflexion. Finally, it was analysed by matrix elements that demonstrated resilience as a competency that impacts the comprehensive education training of engineering students, based on inputs on recognition of Cyrulnik (2006) as well as sense of life of Vanistendael (2006).

Results

Problem identification

For purposes of this research the problems are conceptualized as adversities,, these could be seen as the exposing of a person to a set of different types of risks. It is clear that the human being is facing different adversities during its life, which are not necessarily traumatic (Lemaitre & Puig, 2004).

Cyrulnik (2008) pointed out that he could not speak of resilience process without an occurrence of a trauma. The difference between trauma and testing is that in this latter there are fight, suffering, depression or anger, the individual is still just he and overcoming it. However, in the case of trauma, people remain trapped in the past and often recall images of experienced horror.

Therefore, trauma is something unpredictable to survive and causes the loss of a part of itself. However, in the test the person remains intact, distressed, unhappy, but defined by what it is, so it works well for it (Puig & Rubio, 2011).

The experienced tragedy helps transformation trauma into creative energy and enriches the person life. Acceptance and overcoming trauma are positive thus to contribute to the comprehensive education training. 50% of the subject in the sample showed dysfunctional families.

In some rescued memories of student showed risk factors such as screaming, hitting, crying, sadness, helplessness, humiliation, that somehow remained in their traumatic memory, which is not a normal memory, but it transforms, amplifies or minimizes lived and faced adversities (Cyrulnik, 2010).

Obviously, they are scenarios that generate traumas. However, it is important to note that after a trauma, resilient people generate a common sense: increased confidence in their abilities to face any adversity that may occur in the future (Vera et al, 2006). Therefore memory save images only by listening to a word or aspire a smell that memory uses as mechanisms for identifying adversity, act on lessons learned and address the situation in which the subject constructs part of its resilient competencies.

Facing and solving problem

Find meaning in life even in adversity occurs through positive thoughts. Ask What for? Instead Why? Opens the door to proactivity as Covey (1989) points out, the answer is to think, not to react the answer. This implies the possibility to develop a life project, a possible dream of reaching (Munist et al, 2007).

Engineering students identified adversities in which applied the question What for? They found the solution in their answers. These adversities were: dysfunctional family, diseases, mishaps, addictions, tagging and loss of a loved one, which were faced and solved through internal strategies that demonstrate the self-conscious, critical thinking, morality, initiative, humour sense and independence. These latter elements are considered protective resilience factors.

Therefore it follows that the ability to manage their own limits in relation to problematic or adverse situation, while maintaining a physical and emotional distance from the detected adversity, allow developing resilient competencies in the comprehensive education training of the subject.

Resilient tutor

Resilient individuals develop a way of thinking that sees each adverse situation as something that worthwhile facing and thus placing a value to the effort to achieve goals, objectives and dealing with conflicts.

In this regard, the protective factors are identified as influences, it follows that they are based on the interaction with other or others. These factors give meaning to the individual life to accompany him, advise him, love him and accept him. Cyrulnik points that resilient tutor is the person who accompanies the individual unconditionally, becoming a support and providing confidence and independence during the resilience process.

The resilient tutor can also be represented by an activity, interest and even something as ephemeral a character, a song or a movie (Puig & Rubio, 2011). That is, depending on the world view that the individual has, is its interpretation about the problem because human life is woven with that of others, without the other can not live (Cyrulnik, 2008).

By analysing this element in the life stories shows that engineering students had a resilient tutor who is still impacting on their integral training. These tutors can be represented in the grandparents, mother, professors and friends.

The social relations into the family and into the school strengthened the integral formation of the human being. Empathy allows identifying the moods of others and achieving the understanding of the attitudes and behaviours of others to improve relationships. In resilience, interaction with others allows building on the individual strengths that overcome different adversities. The presence of the other becomes fundamental.

Reflection

Critical thought is a resilience competency because it develops the ability to analyse causes and responsibilities of the adversity (Melillo, Ruboo & Morato, 2004). It also allows reflect on gains to emerge stronger. Some of these reflections are showed in the following example:

Subject 6

> *Each passing day new things excite to me, appear new dreams, new goals, new people, new challenges. That is why we always try to have a "winning" attitude, for whatever comes does not matter so hard as it is do not cost me adapt myself.*

This was considered to identify the meaning of life as a product to analyse adverse situations and be able to dominate personal existence, how to plan in order to give orientation to life, because although the individual is accompanied by another, but he is the only one who take the decision to continue. Others give meaning to his life through recognizing. This encourages positive self-esteem and allows the development of resilience (Werner & Smith, 1992) and thus his comprehensive education training.

It is expected that the implementation of model competency-based education strengthens the overall education of college students so it is necessary that the knowledge, skills and attitudes are developed not only in the classroom but in the context of the university as a whole.

The identification and resolution of problems, tutor support and reflective thinking are evidence of the formation of the student as it faces the problem and solves it, is transformed and becomes a better person.

Conclusions

In this stage of the study we confirm that the subjectivity of the individual is part of the resilience. What for someone something is a problem for others it is not. In this sense, some people have personal characteristics that help them facing high levels of stress, protecting them for not lose control, and becoming tools that impact their comprehensive education training.

Past plays an important roll in life's people. Often it becomes a burden that does not allow go forward, makes weighing and load their anger, helplessness, sadness, despair and ignorance of themselves. All this becomes an insurmountable barrier limiting development of resilience and comprehensive training.

In the case of the students we observed that, despite the storms in their lives, they kept their direction, looked after themselves and looked for support from

people close them. In this sense, we observed that a transcendental factor is present in resilience: the accompaniment.

Consequently, protective factors as critical thought, independence, interpersonal intelligence, interaction, recognition and meaning of life are considered as resilient competencies developed in the individual comprehensive education training because when a person achieves its own worth that person allows flow its honesty and responsibility therefore gets a balance between being, doing and knowing.

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Dra. Lilia Benítez Corona
Universidad Polítecnica de Pachuca
México
lybeco@upp.edu.mx

Dra. Reyna del Carmen Martínez Rodríguez
Universidad Politécnica de Pachuca Hidalgo
México
reyna@upp.edu.mx