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## **Facilitating student development in the self-directed approach to learning**

### Summary

Modern academic tuition does not go along the academic lines of mass schooling. Tuition at universities sets up different objectives. It is crucial for the economic growth of countries. Therefore, significant attention is paid to the utilitarian character of academic knowledge. The effects of academic tuition are perceived as focusing on the student individuality. Being a university student implies playing a certain role, where norms of conduct, lifestyle, and professed values result from identification with the academic community, a sense of belonging to the elite of youth, characterized by an autonomy of its activity. Autonomous approach to the students' own development is expressed by self-directedness, self-directed learning and choosing methods which facilitate constructing one's own knowledge instead of its non-reflective acquisition. Employing concept maps is a method which facilitates subjective building of cognitive personal knowledge structures. The method uses visual techniques of learning, where the structure, or – more precisely – elements of a phenomenon are recorded, in order to grasp relationships and dependencies existing between them. Becoming conscious of these relations allows understanding them, which is a necessary condition of knowledge

In our time, to continue sustaining an educational style of prioritizing on recreation of acquired knowledge would be an anachronism. Instead, the energy of teachers and students alike, should be directed at constructing predisposition and capability of searching and creative effort towards solving multi-dimensional and widely-conditioned economical, technological, social and ecological problems. The second approach, which promotes intrinsic initiative in the student, however, requires effort and caring for the full individual development of the individual from the teacher. Education at the university puts forward higher and by definition – different – standards than education at school. Universities aim to create useful knowledge and incorporate its outcome, the discovery into the social sphere. The meaning of universities has been recognized by state authorities as playing a key role in the creation of a globalized world.

Universities deal with the universality of knowledge; they are concerned with human beings in all their manifestations – biological, mental, emotional, objective and

subjective – and their social, cultural and economic organisations and interactions with each other; they are concerned with the physical world within which human beings find themselves. They seek to understand that which we do not understand; they seek to explain complexity; they seek to discover that which is hidden from us. They seek to establish what is common to all of us and what distinguishes us each from another or each group from another. These things are common to the whole of university endeavour whatever the discipline. They are not “academic” in the pejorative sense of the word, but are of profound, practical utility. They are the foundation upon which the university enterprise rests and upon which its significance for society is built.<sup>1</sup>

The high quality of economy depends on the universality of higher education. University education is an object of special attention of European states. Direct influence of benefits for the economic development of countries from research conducted at universities is being noticed:

The statements of government ministers, officials, funding agencies and research councils have in the last decade or so generally developed the following themes:

- that the function of universities is to provide direct in-out benefits for society’s economic prosperity;
- that there is a direct relationship between university applied research and economic prosperity through the medium of scientific and technical innovation spreading into the economy;
- that there is a high correlation between prosperity, social contentment and university research in science and technology;
- and, by implication, that universities have a primary duty to engage in this socially useful activity in exchange for taxpayers’ support, and that research should only be supported if it is in the immediate national interest.<sup>2</sup>

The quality of knowledge, invention, discovery, theory and ideas which may help boost the economy depends on the quality of academic tuition. Mass access to higher education we see in Poland, is not a satisfactory argument towards expecting the economy to grow significantly. The higher academic reform being implemented in our country aims at our universities catching up with those in Western Europe in terms of the quality of tuition. There has been a heated debate on the principles of this reform, its regulations, intentions, and

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<sup>1</sup> G.Boulton, C.Lucas, What are universities for? League for European Research Universities, Amsterdam... Zurich, September 2008.

<sup>2</sup> G.Boulton, C.Lucas, What are universities for? League for European Research Universities, Amsterdam... Zurich, September 2008.

possibilities of implementation, which is a good proof of engagement into improving the quality of tuition in Poland not only from the Ministry of Education but also academics, representatives of employees, and of course, students.

Self-directedness, conscientiousness, integrity in reaching truths about the world, criticism, independent thinking, and a scope of other characteristics necessary in personal and professional process of self-actualization do not come from nothing. On the contrary, they require nurturing and care from teachers. That is why the debate surrounding the reform of academic tuition, despite noticeable, important challenges connected with consideration of the influence the changes in modern society related to the progress of the digital society have on modern education, personal engagement from the learner with the effects of their education and responsibility for its direction as well as with the outcome of the learner's effort should be considered. In order to consciously direct one's own life, the student should adopt the attitude of self-directedness.

It is characteristic of our time that all aspects of our life have become changeable and unforeseeable. The processes of globalization are leading to global transformation. Faster flow of information is increasing economic growth. It also affects the growth of building new qualities and goods and new knowledge due to the achievements and discoveries of scientists worldwide. As H. Handy put it, in the face of fragmentation of ownership each citizen should have a share in the owned, and in the wealth they contribute to. Ownership expressed in possessing material goods enforced such organization of the society, where the drive to possess such understood value brought about social divisions, lead to wars and conflict. Ownership expressed in substitute means such as currency or assets was also stood for the material sphere and partly depended on the possessor's background, partly on their industriousness, still created social gaps. The 21<sup>st</sup> century is an age of knowledge. Handy refers to it as intelligence as a characteristic of individuals who employ their knowledge. „Focused intelligence, the ability to acquire and apply knowledge and know-how are new sources of wealth.”<sup>3</sup> In the world of mass communication and mass broadcasting one may look for chances at obtaining wealth not only through using non-limited resources. One should also have in mind the significant influence of arising consumer preference, needs, values, and finally – that independent thinking is in danger of becoming a privilege of few. Such fears seem to be supported by the character of the operation of modern educational institutions. Despite the many years of calls to change the approach to education, reforms on

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<sup>3</sup> CH.Handy, Wiek paradoksu. W poszukiwaniu sensu przyszłości. Warszawa 1996, s. 29.

the level of obligatory education – the national system of education, being currently introduced on the academic level, observation of educational practice still makes it necessary to judge the direction of actions for educational change cautiously. The constructivist approach aiming at co-organizing the sphere of education with the learning subject is either merely a declaration or exception in the sense of the individual teacher, who represents exceptional, facilitatory skills as an educator. In the changing conditions of modern life, education remains in a fossilized mode of operation. Tuition is highly formalized, not considering individual needs of learners, which results in its low effectiveness. The task of teachers is to facilitate student learning, which is a process of *knowledge acquisition*. The term *acquisition* is usually associated with an action of taking possession, taking or even buying something. It is an action towards possessing something already made, final, defined and tradable. Knowledge in this sense is a good whose possession is expected and can be measured. This results in justifying the difference between the level of information on the part of the student, and that assumed by the teacher. According to this perspective, all techniques of controlling and evaluation of this level of acquisition can precisely measure and evaluate it in the form of a school grade. Knowledge acquisition is inseparably bound with the process of memorization. Such approach to the process of education arises from possessed knowledge on the process of learning and an adopted philosophy of education. To a large extent, transmission theory education remains one example. Its model accepts that knowledge is predetermined, sure and unique, this resulting from the fact that the model adopts the methods used in empirical science, which aims at describing the objective reality. As everything has been discovered, the task of the student is to acquire, learn these truths to an extent they are capable of, which will be checked and evaluated by the teacher. Such knowledge cannot be related to the learner's personal experience, it is neutral and therefore uninteresting. Repetition of acquired knowledge largely overweighs its making by the learners supported, directed and aided by the teacher. Transmission theory education too often dominates in educational practice. Such mental twist requires ears of acquiring new skills by teachers and even more so – new mentality and attitude towards their role in the process of education. This process, taking place in each working day in each school, is aimed at acquisition of a predefined bulk of knowledge, skill and habits. Such definitions can be found in handbooks of teaching. Despite not all arguments placed therein being applied in educational practice, in this case it can surprisingly be observed that these words are fully put into practice.

The idea of the term *achievement* is important in the meaning of the process of learning. It includes a certain assumption that there is a standard, a level of knowing, skill and habit

students should aim at in their efforts. The process of learning is too often limited almost solely to memorization. Diligence is identified with a greater amount of repetition, and repetition sadly is too often the dominant method of learning. Education becomes a strife towards the best possible method of *transferring* information to students. This transfer is a one-way, closed process in which no change in its content is accepted.

Mass access to higher education and collective form dominance in the organization of teaching and learning processes, tend to expose the group and a series of intentional influence university students makes them lose their individuality. Individuality is all the characteristics of those who give it its uniqueness and value. These features may be a factor supporting its own development and achieve success in individual life, and in communities they can be used to implement the common good. Individuality is often perceived as a condition of personality focused on self-development, using intellectual and moral freedom to achieve the most valuable, socially acceptable manifestation of oneself, to develop one's real possibilities - creative powers, talents and skills.

At the university, individuality should be the basis of creative, intersubjective relationships. The university, as having tolerance included in its "philosophy of being" is required to create an environment in which individuality and uniqueness of the students could develop, and this means that it should not only be tolerated, but facilitate situations in which students will be able to:

- self-set goals and lines of conduct in the pursuit of their values and needs. Perceive themselves as the causative agent of their own situation;
- defend their moral positions, their relevance to other people's intellectual freedom, the right to independence and opinions, seek the respect of their self-worth and personal dignity;
- be open, honest, critical of themselves, ready to bring corrections to their actions and associated conditions, but also to resist orders and prohibitions against their own creativity;
- make moral choices in conflict situations, endure failure and loss, critically evaluate themselves and be capable of innovative thought;
- be accountable for the results of operations and moral choices, justifying choices of others and the inside of one's ego.<sup>4</sup>

The possibility of manifestation of these behaviors and actions corresponding to these conditions occurs as a result of pedagogically valuable contact between teachers and students in teaching situations. It creates the psychosocial atmosphere

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<sup>4</sup> K. Jaskot, *Funkcje szkoły wyższej jako instytucji edukacyjnej*, [w:] *Wprowadzenie do pedagogiki szkoły wyższej* (red. K.W. Jaskot), Szczecin 2006, 408-409.

in which the student's individuality can be realized and developed. Since it requires teachers to recognize that in today's conditions individuality and uniqueness will decide on the value of the graduate of a college or university. They will allow finding the right jobs and obtain a sense of worth and uniqueness in a person and their role. This requires from students a sense of autonomy and ability to distance themselves from the accepted standards of "a learner." Only then intentional building of their individuality throughout the period of study will take place.<sup>5</sup>

Modernity does not want to live in our universities. Along with the changing world and opening up to new concepts hope has been seen in new technologies. However, they can not replace thinking and reasoning. The hope is in a new philosophy of education permeated by new ways of reaching out to information, transforming it into personal knowledge, developing new internalized values that enrich learners at the level of internal wealth. Evolving social conditions call for an individual who is ready for new behaviors, open to new ideas in all aspects of life, and enjoying the enrichment from knowledge and culture of others. To find oneself in this world, not just function in it, but to be able to actively and satisfactorily create it, each person must possess inexhaustible creativity, openness, tolerance and willingness to act. Such features should be developed in education institutions. However, this is not happening. Educational institutions at all levels as ones of the few institutions of the modern world do not seem to be touched by civilization changes. Delivering consistently ossified knowledge, formal and structured, "indisputable" and "reliable" (given) they do not create opportunities to develop competencies needed by contemporary people. The methods of teaching are inextricably linked to the method of checking the changes in the learner. Even reorientation of the process to constructivist learning is difficult to implement consistently and in an undisturbed manner against the force of a unified formula, categorized the central examination which is the standard in Poland. „Constructivism is a theory of knowledge growth and life-long development built on a philosophy of pragmatism. In the context of formal education, it is frequently used as pedagogical label for sense-making activities including discovery, inquiry, exploration, and hands-on learning. It is often set in opposition to behaviorist methods, where external reinforcement regulate learning, as well as direct instruction, where students are told or shown what to do.”<sup>6</sup>

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<sup>5</sup>K. Jaskot, *Funkcje szkoły wyższej jako instytucji edukacyjnej*, [w:] *Wprowadzenie do pedagogiki szkoły wyższej* (red. K.W. Jaskot), Szczecin 2006, s. 409.

<sup>6</sup> D.L.Schwartz, R.Lindgren, S.Lewis, *Constructivism in an Age of Non-Constructivist Assessments*. In: *Constructivist Instruction. Success or Failure?* Routledge Tylor &Francis Group, Ney York and London 2009, p 3.

Knowledge includes not only facts, theoretical assumptions and theories derived from observation of the surrounding world. Knowledge is the ability to multi-use information. It consists of considerations relating to a wide range of issues, feelings that influence the perception of reality and interpretations of facts. The purpose of acquiring knowledge is the discovery of an objective, independent observer of reality. Objective knowledge is sometimes variable. It serves explaining how to operate a reality that is experienced by the observer, and finding ways to cope with what he or she experiences. The aim of education is not simply assimilation knowledge and mastery of skills. The knowledge that we collect includes steadily developing ability to organize the acquired messages. These skills are useful in the practical experience. Knowledge of the learner is not dead deposit. It is a dynamic creation corresponding to questions arising from the reflection analysis. Therefore, creating your own knowledge we become responsible for the process of its acquisition. It depends on finding the proper answers to the questions we ourselves raise. Control over the learning process is not without significance. It becomes a perceived tool necessary to the subject. Answers to personal questions are delivered by dynamic knowledge, whose elements form a coherent system and are related to cause and effect relations.

As the learning individual enriches their experience of knowledge creation, they increasingly base on subjectively and constantly sought new methods. Learning is a dynamic process. It consists in constructing personal meanings through inquiry, exploration and discovery of multiple subjective world. With the support of a teacher who leads the learner by provoking events and encourages making of hypotheses, their verification by practical action embedded in the culture in which a inter-individual knowledge is created. Relation to culture adds authenticity to the knowledge created, it gives an impetus to the dynamism of the knowledge living. Such an understanding of knowledge is of subjective character. The role of the learner changes from that of the passive assimilator of content selected for them. The learner is actively interested in constructing new meanings. The task of the teacher is not transmission of information, correcting deficiencies of understanding the learner's demonstration of skills that learners should learn. The new teacher's tasks are to direct the student into new ways of interpreting reality. In order of the teacher's actions to be relevant and effective it is important to discern the learner's state of knowledge, the expectations and attitudes towards the explored reality. To this end, the teacher should be understanding about the student's prior knowledge, their experiences, thoughts and expectations related to the study. „Constructivist learning theory argues that new knowledge should be integrated into existing structures in order to be remembered and receive meaning. Concept mapping

stimulates this process by making it explicit and requiring the learner to pay attention to the relationship between concepts”<sup>7</sup>.

At the university, the educational process is based on autonomy and student activity. Internal and formal involvement of young people in the process of acquiring new information means that they acquire an ability to critically evaluate facts and solve problems independently. Adulthood, aspirations and willingness to act is so characteristic of this period of young peoples’ life, making them active participants and organizers of the educational process, and therefore more accountable for the consequences. Studying depends largely on the learner's individual work and individual autonomy expressed in the responsibility for one’s own development, choices, and the quality of learning as well as its effects. To study is to perform a certain role in society where standards of conduct, lifestyle, values presented by the learner result from identifying with the academic community.<sup>8</sup>

Autonomy is a kind of self-government, freedom, the ability to make free choices. In psychology, it is most often understood as maintaining the integrity of the self. One can also say that autonomy means self-directing one’s own actions. Autonomy is the ability of critical reflection, decision-making and independent action. Such view of autonomy should describe university students. As future potential members of social elites, they should be able to make choices in the evaluation of social life. An autonomous student is a self-actualizing individual. Self-actualization is fundamental as a concept in humanistic psychology, referring to the determinants of positive human development. “Actualization” is rather broad and ambiguous. It is considered as the tendency of human development as a process where the dynamics are determined by many factors of internal and external nature, and as an ideal pattern of optimal functioning of personality.<sup>9</sup> Theorists believe that most people have the ability to self-actualize, i.e. an aptness for the creativity, spontaneity, constructive, and kindness to others. Self-actualizing people are characterized by planning their actions and forward-thinking. Thanks to the ability to accept oneself and the surrounding world they are able to reasonably evaluate their flaws and yet they can take the toil of work on themselves and improve their weaknesses. Self-actualizing individuals are not afraid of the new and the unknown, and they easily tolerate ambiguity and uncertainty. They are focused on the task rather than on their own ego. They are responsible and have a sense of mission in life. Such people can be

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<sup>7</sup> E.Plotnik, Concept Mapping: A Graphical System for Understanding the Relationship between Concepts, *ERIC Educational Reports / 01, 1997*

<sup>8</sup> D.Ciechanowska, *Kultura studiowania. W: Proces kształcenia akademickiego studenta*. Red. D. Ciechanowska, Szczecin 2009.

<sup>9</sup> J.Janowska, *Samoaktualizacja w teorii i praktyce kształcenia nauczycieli*. Lublin 2003, s 17



referred as self-directed. It is a feature emphasized by all theorists of self-actualization. Such individuals do not rely on cheap conformism and the desire to fit in. They are autonomous, guided by the laws of their character and their own value system, rather than the rules imposed by society. Self-actualizing people feel a great need for privacy and distance from the reality. They are able to endure loneliness without harm to themselves and without much trouble. They are able to assess issues including new elements and thus to correct their previous assessments of the problem. They react very strongly emotionally in situations of personal involvement.

Self-actualizing people present easily noticeable features of a democratic individual, they are sympathetic to all regardless their education and social status, they naturally express sincere respect for people who can teach them something. They do not value the superficial and pragmatic contacts, but rather setting up targets and putting effort into meeting them. They are focused more on objectives than on means. They are characterized by a philosophical sense of humor – reflecting and never criticizing. Each self-actualizing person is a creative individual, able to combine work and entertainment, avoiding dualism in their lifestyle. As it can be inferred, such an individual is able to maximally use their potential, is a rational evaluator of their own life, possibilities and challenges. He or she finds it both satisfying and fulfilling. It is important that the self-actualizing individual is able to function in conditions allowing his or her growth. Satisfying the needs for growth provides one a chance to become a self-actualizing individual. The role of the educational and pedagogical process is crucial here, as well as socializing influence and the possibilities created by educational institutions, so that the self-actualizing young person is able to contribute to the human capital with their potential. The self-actualizing individual is directed at self-growth. In Western theories self-direction is often used as a close concept to self-actualization.

*Self-direction* is one of the groups of values created by Shalom Schwarz. It is placed on the pole of openness to change. In the group of values defined as self-direction we will find liberty, independence, curiosity, creativity, ability to set up goals, or self-respect. In another division of values, the same author enumerates seven groups of values, among which one can find intellectual autonomy. In the presented diagrams the structure of self-steering is closest in meaning to the intellectual autonomy. It is understood as a self-steering action on the basis of self-judgment, not limiting oneself with the acquired views, actively seeking and wanting change, subjectivity in life and sense of freedom. On the basis of a more general

attitude of self-steering its focus on education can result. Then, self-directed learning<sup>10</sup> occurs. It is a type of learning where the knowledge of the learner is affected, the learner self-reliantly decides on whether they wish to learn, and what they wish to learn, in what conditions and last but not least – is able to independently define what they want to achieve. He or she has a stable belief on this, based on inner values. Self-directed learning as a process where the learner makes decisions regarding planning, evaluation and the process itself, is widely discussed in Western literature.<sup>11</sup> First theoretical conceptualizations of SDL were released in the 1970s (Tough, Knowles), had a linear character and illustrated a sequence of steps of learner action, taken on the learner's own initiative. A wider proposal of such a process was presented by Knowles in 1975. His description of the process of self-directed learning contained six steps: (1) climate setting, (2) diagnosing learning needs, (3) formulating learning goals, (4) identifying human and material resources for learning, (5) choosing and implementing appropriate learning strategies, and (6) evaluating learning outcomes<sup>12</sup>. Interactive models of self-directed learning were created in the belief that the process of learning does not always happen in a linear way, and that its planning is not always possible, or it is not a conscious process to the learner. Spear, Brockett and Hiemstra, Garrison and Danis were the authors who created those interactive models.<sup>13</sup> “Garrison is the most recent scholar to propose a multidimensional and interactive model of self-directed learning. His model, grounded in a „collaborative constructivist” perspective, „integrates self-management (contextual control), self monitoring (cognitive responsibility) and motivational (entering and task) dimensions to reflect a meaningful and worthwhile approach to self-directed learning”<sup>14</sup>. A third category of self-directed learning models are “instructional models”. Grow, Hammond and Collins have developed models, which consider teacher support, thanks to which the students may become more self-directed in their learning. The models indicate levels of student advancement in the process of becoming self-directed. Grow constructed the Staged Self-Directed Learning (SSDL) model, which includes several levels: stage 1-Dependent learner, stage 2-Interested learner, stage 3- Involved learner, stage 4- Self-directed learner.<sup>15</sup>

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<sup>10</sup> D.Ciechanowska, Samokierowane uczenie się (Self-Directed Learning) jako wartość kształcenia akademickiego. W: Studiowanie dla społeczeństwa wiedzy. Rd D.Ciechanowska, Toruń, 2009

<sup>11</sup> D.Ciechanowska, Self-Directed Learning. Próba konceptualizacji pojęcia na gruncie edukacji dorosłych. W : Rocznik Andragogiczny 2009.

<sup>12</sup> S.B, Merriam, R.S.Caffarella, L.M.Baumgartner, Learning in Adulthood. A Comprehensive Guide. United States of America, Third Edition, 2007.

<sup>13</sup> Op cit, p. 111

<sup>14</sup> Op.cit.p. 114

<sup>15</sup> Op.cit.p.117

On each level, Grow indicates a possible role and tasks for the teacher supporting the student in their development.

Supporting the student in their autonomous attitude towards self-development requires assistance, providing knowledge in a form that will help them solve a problem. A student who sets up their own goals also chooses the methods of working. Optimizing work on a given task, often performed in cooperation with other students, requires application of different methods than e.g. discussion. One method that is helpful to the learner in organizing new information are graphic ways of organizing knowledge, known as the group of visual learning techniques. The analysis of learning styles indicates individual preference in methods of learning. There is a large group of learners who prefer the visual style, displaying the following characteristics: Visual learners learn best by seeing information:

1. Information presented in pictures, charts, or diagrams is easily remembered.
2. Visual learners have strong visualization skills. They can look up (often up to the left) and "see" the information invisibly written or drawn.
3. Visual learners can make "movies in their minds" of information they are reading. Their movies are often vivid and detailed.
4. Visual-spatial skills such as sizes, shapes, textures, angles, and three-dimensional depths are strong.
5. Visual learners often pay close attention to the body language of others (facial expressions, eyes, stance, etc).
6. Visual learners have a keen awareness of the aesthetics, the beauty of the physical environment, visual media, or art.

Visual learning techniques are based on graphic representations of information. Studies have shown that visual learning is one of the most effective ways supporting learning to think seen as the ability to creatively use information. Graphic techniques based on visual teaching serve absorbing information and illustrating facts and ideas. Images, icon and word are used here. Another type of graphic techniques serves depicting relations between information. Diagrams, charts, schemes and such can be named as examples. These aides help understand the construction of buildings, the structure of an atom, methods of operation or components of complex structures. All abovementioned methods of using graphic techniques are of static character. The learner observes, learns in a facilitated way absorbs knowledge via graphic representations which, as studies show, is a dominant style in most people. Learning based on such representations is of transmissional character.

Another type of activity encourages using word in visual learning. Knowledge is included in language. Grammatical and lexical structures reflect the way of understanding the world. Language serves to transfer information and build communicates. The way of understanding the language depends not only on the choice of vocabulary. A great influence comes from the cultural context of the sender and receiver. Using the same language, communicates may be differently understood. The way language forms an idea is expressed by constructs of personal knowledge. In this group, we can find clustering, which is a technique serving organization and generalization of (ideas), spider maps, writing charts, concept mapping, fishbone maps, events chains, cycle circle, continuum scale, charts, posters and unit organizers. Assuming that knowledge as information can be represented in the form of written word, one can create such transcription, which visually illustrates elements comprising the main idea and relations between these elements. Adopting a constructivist perspective in building personal knowledge is bound to reject a priori structures. Constructing knowledge lies in subjective creation of cognitive structures thanks to one's own cognitive activity and learning by doing. The information collected as schemes built from words make up new structures of personal knowledge. The richer prior knowledge, the richer the structures they create. However, in order the knowledge collected in this way be of dynamic character, its individual elements must remain related in a cause-and-effect manner. The structures should represent their mutual relations and dependencies. For this reason also, not all visual techniques can be used to model the learner's knowledge. They illustrate an objective structure, one of a complex element, and not personal knowledge of a learner.

Creating personal knowledge structures is a method of organizing collected information, where the focus is on presenting connections and relations between it. They can form a structure of meaning, created by the learner. Each learner has a different prior set of knowledge. New is created in relation and against the structure of the existing. Certain structures can be developed, others built from scratch, but all in relation to the existing state. "During the process of learning and problem solving a concept map as an external representation of semantic memory may also help the learner overcoming problems that are due to the limitations of short term memory in both capacity and duration of stored information. Combining visual and verbal modes for cognitive processing reduces the burden on working memory, expanding the brain's ability for coping with complex cognitive task requirement."<sup>16</sup> Each individual expresses different interests, ones that modify the way of

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<sup>16</sup> S. O. Tergan, Concept Maps For Managing Individual Knowledge. <http://intraspec.ca/cogmap/Tergan.pdf>

perceiving information that reaches them. The culture in which the learner is immersed adds a character to meaning they construct. Due to the mentioned factors, the same information reaching listeners at the same lecture will have different representations in the minds of the listeners, thereby forming structures of knowledge:

Since their development, concept maps have been widely used for many purposes and in many different contexts. They are most well known to science education researchers and teachers as a metacognitive tool that helps students understand the science they study. Concept maps have also been shown to be useful for (a) providing a summary of a person's existing knowledge, (b) identifying misconceptions, (c) revealing gaps in understanding, (d) promoting reflective thinking, (e) designing curricula and instructional materials, (f) assessing student learning, (g) evaluating program effectiveness, (h) facilitating communication and arriving at shared understandings among members of groups, (i) understanding the processes by which scientists construct new knowledge, and (j) studying problems in epistemological foundations and assumptions.<sup>17</sup>

Using language in visual techniques of learning is both a creative and a diagnostic tool. Concept maps are techniques that allow recording the structure of a given phenomenon, and to be precise, elements that comprise a phenomenon. Concept maps employ metaphor and categories to record the structure of information stored by a person. They are a major step forward in methods of recording the structure of meaning. The collected information becomes structured and hierarchized. Sometimes, it is a set of loose, unconnected concepts, between which no relations can be observed. Until the learner tries to record the terms, questions and concepts as representations comprising a problem, they often will not see the connections and relations between them. A concept map is a spatial array that represents elements of knowledge by means of nodes and links, the nodes representing ideas, concepts, and beliefs and the links relations between them. Multiple linkages between concepts may depict how each concept is related to other concepts. Concept mapping is suggested "to take advantage of the remarkable capabilities of the human visual perception system and the benefits of visual information representation. These benefits include (a) ease of recognition keywords, (c)

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<sup>17</sup> R. J. Iuli, G.Hellden, Using Concept Maps as a Research Tool in Science Education Research. Concept Maps: Theory, Methodology, Technology, Pamplona, Spain 2004

compactness of representation, and (d) the observation that it seems to be, (b) the possibility to quickly scan a picture and find differences or easier to keep an overview.”<sup>18</sup>

An individual’s knowledge is the collected set of information, which is interrelated in logical and semantic structures, metaphor and categories. The structuring is a unique system just as any human being is one.

In order to facilitate knowledge use mental representations of knowledge have to be structured and represented task-appropriately. Knowledge representations must easily be restructured and adaptable to different situations, tasks, individual interests and contexts of use has been suggested that concept mapping may enhance the processing capacities of the human brain. A necessary precondition for this is that the knowledge must be represented explicitly and knowledge elements must be accessible freely and trackable easily. Map-based visualizations of ideas and individual knowledge representations match these conditions. Concept mapping has proven to be a valuable cognitive tool for supporting cognitive functions in a variety of learning and instructional settings, among them scaffolding cognitive processing in knowledge acquisition and problem solving<sup>19</sup>.

Sometimes, what the learner has managed to accumulate in the process of learning is just a set of loosely assorted facts which they cannot relate to one another. It is an image of learning seen as acquisition, characteristic of transmission, bank-type education. Unfortunately, it is notorious that learners present such sets of loose, scattered information, which they accumulated without consideration of a wide context. In consequence, education based on „objective”, assumed knowledge, a packet to be assimilated, results in no reflection on the lack of structure of the collected knowledge. The learner believes that this is the desired effect of school education, since she or he put a lot of effort into memorizing it.

The use of concept maps in many areas is gaining popularity. Computers are used for applying this technique, which opens wholly new possibilities for education and companies alike – everywhere, where holistic thinking and perspectives help in solving problems. It is also easy, thanks to the existing software: “Once a concept map is created using a computer, the program usually allows the user to convert the map to different electronic formats. These can be vector or bitmapped images, a text outline, or even a hypertext structure. These electronic formats can then be stored, sent, manipulated, used, printed, and deleted just like

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<sup>18</sup> S. O. Tergan, Concept Maps For Managing Individual Knowledge. <http://intraspec.ca/cogmap/Tergan.pdf>

<sup>19</sup> S. O. Tergan, op. cit.

any computer file.”<sup>20</sup> Formal sciences such as chemistry or physics, life sciences as biology or ecology and humanities alike apply the wide spectrum of electronic tools to create both simple and complex structures of knowledge.<sup>21</sup>

Evaluating student knowledge has always been a difficult task. „Simple as this may appear, it is profoundly difficult to ascertain precisely what a person already knows. In fact, it was this problem that led us to the development of the concept map tool, as noted above. While it is difficult to assess what an individual knows about a given topic or problem, it is even more difficult to assess precisely what a study team or group knows. Here again we have found concept maps to be an expedient and effective tool. We have also found it very important to define carefully the problem or issue to be addressed and to construct carefully a “focus question” to guide the knowledge elicitation process.”<sup>22</sup> The use of concept maps as a tool for evaluation of acquired knowledge seems to be a priceless one. It is a new concept to our teaching practice, but one worth wide promotion. “Concept maps can also be used as assessment tools. The research team around Joseph Novak at Cornell found that an important by-product of concept mapping is its ability to detect or illustrate the "misconceptions" learners may have as explanations of content matter. The conceptions students may have are often incomplete and deficient leading to misunderstanding of instruction. Concept maps drawn by students express their conceptions (or their misconceptions) and can help the instructor diagnose the misconceptions that make the instruction ineffective.”<sup>23</sup>

The on-going dispute on the accuracy of ways of evaluation in external exams for pupils leaving gymnasium (comparable to British grammar school and US college preparatory school) and high school-leaving exams Matura at the age of 18, still confirms the doubts on the character of knowledge pupils should acquire – or, to put it another way – memorize at school. Attempts to make pupils build their own personal knowledge, to be inquiring and scientifically open must fail in the situation when they are required just to know some facts presented in a particular way. Even seemingly open tasks where the pupil is supposed to think independently such as literature essays are also subject to categorized evaluation. The

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<sup>20</sup> E. Plotnik, Concept Mapping: A Graphical System for Understanding the Relationship between Concepts, *ERIC Educational Reports / 01, 1997*

<sup>21</sup>E.g : E. Gouli, Concept Mapping in Didactics of Informatics. Assessment as a Tool for Learning in Web-based and Adaptive Educational Environments. <http://cgi.di.uoa.gr/~phdsbook/files/gouli.pdf> ; S. O. Tergan, Managing knowledge with computer-based mapping tools. In: D. Lassner & C. Mc Naught (Eds). Proceedings of the ED-Media 2—3. Word Conference on Educational Multimedia, Hypermedia & Telecommunication, Honolulu.

<sup>22</sup> J. D. Novak & A. J. Cañas, The Universality and Ubiquitousness of Concept Maps, *Concept Maps: Making Learning Meaningful*, Viña del Mar, Chile, 2010.

<sup>23</sup> E. Plotnik, Concept Mapping: A Graphical System for Understanding the Relationship between Concepts, *ERIC Educational Reports / 01, 1997*

pupil is thence forced to learn according to the criticized transmission education model. Such high school graduate reaches university where he or she is expected to be self-directed, autonomous and subjective. These expectations match university students – representatives of the young elite. At the same time these expectations aim high above the possibilities of the young person, who has been shaped in a different manner, diligently trained during the 9 years of school, so it is hard for him or her to change well-developed habits. The task in front of universities is therefore aiming at improvement of the quality of education by means of such methods of working with the students, which will activate their potential, sleeping due to the present methods of teaching and testing.

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