PSYCHOLOGICAL SCIENCE CHALLANGES IN MODERN DIGITAL TRAINING ENVIRONMENT

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The article is devoted to the efficiency of students' cognitive and personality development within University traditional training and e-learning online that are based on the subject-centred or human-centred models. The research relevance is explained by the unprecedented growth of the digital mode of knowledge acquisition that has revealed misbalance between new technical possibilities and psycho-pedagogical competence of training courses developers. An urgent need of interdisciplinary interaction aimed at the training environment creation with consideration of the psychological laws of human memory and thinking functioning appeared. It is proposed the working human-centred model of students' cognitive and personal development under condition of system e-learning online that is built on the bases of psycho-pedagogical laws of eco-humanistic self-development. The research is based on the longitude training experiment that was organized within real university training including e-learning online. The results were processed mathematically. The efficiency of the cognitive development was measured by the complexity of the individual sense-cognitive scheme formed

within training, by the level of metacognitive competence, by the efficiency of subject task solving. The efficiency of the personality development was measured by the level of personal sense development, abilities and qualities that are professionally, socially and existentially significant. The results obtained proved advantage of the training that is based on the psycho-pedagogical student-centred model over the subject-centred training. The developmental effect of the human-centred e-learning has left behind the subject-centred training supported by platforms with orientation to their technical capability.

Keywords: *e-learning online, student-centred model, self-development technology, metacognitive approach, synergy effect.*

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Наукові виклики у сучасному е-навчанні
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Мета: Стаття присвячена дослідженню ефективності когнітивного і особистісного розвитку студентів в рамках традиційного університетського навчання і е-навчання онлайн, які побудовані на основі моделей, що центровані на навчальному предметі або на студенті. Актуальність дослідження викликана безпрецедентним ростом цифрових форм набуття знань, що виявив дисбаланс між новими технічними можливостями і психолого-педагогічною компетентністю розробників навчальних курсів. Виникла гостра потреба в міждисциплінарній взаємодії, що спрямована на створення навчального середовища з урахуванням психологічних закономірностей роботи людської пам'яті і мислення.

Результати: Продемонстрована працююча людино-центрована модель когнітивного і особистісного розвитку студентів в умовах системного е-навчання онлайн, що побудована на основі психолого-педагогічних закономірностей еко-гуманістичного саморозвитку. В основу дослідження покладений довготривалий навчальний експеримент, який проводився в умовах університетського е-навчання онлайн. Результати піддавалися математичній обробці. Ефективність когнітивного розвитку вимірювалася складністю сформованої в е-навчанні когнітивно-смислової структури; рівнем розвитку метакогнітивної компетентності; ефективністю рішення предметних задач. Ефективність особистісного розвитку

вимірювалася рівнем розвитку особистісних смислів; професійно, соціально і екзистенційно значущих здібностей і якостей.

Висновки: Отримані результати показали перевагу навчання, що побудовано на основі психолого-педагогічної моделі, яка центрована на студенті, в порівнянні з навчанням, яке центровано на навчальному предметі. Розвиваючий ефект людино-центрованого е-навчання онлайн значно перевершив результати предмет-центрованого навчання, що підтримується платформами з орієнтацією на технічні можливості.

Ключові слова: е-навчання онлайн; модель, що центрована на студенті; технологія саморозвитку, метакогнітивний підхід, синергетичний ефект.

Introduction. Last decade we witness the unprecedented expansion of the digital technologies to nearly all spheres of our life including education. At this point our universities faced with the challenge when students as users occurred ahead of trainers. Modern generation learn new technical facilities spontaneously and involuntary in the process of their growth and development well in advance of entering the University. They receive practically unlimited access to the information and develop their cognitive scheme outside official system of education loosely and irregularly but gaily and entertaining. Facing off with the official system of education that is traditionally conservative with its established approaches and methods the newly appeared students turn to be unprepared to the system work that demands intellectual and strong-willed efforts.

At the same time our system of official education itself fails to keep up with the established pace of conversion to meet the challenges of modern technologies and new generation demands. An urgent need of interdisciplinary competence that allows transforming existent systematic courses into digital format without loosing their quality appeared. State economic system turned to be not ready to material investment into expensive technical re-equipment of the Universities as well as to the financial support of labour and time consuming development of innovative transformation projects. The state passed the buck by putting the task of state scale onto the shoulders of the Universities.

As a result our Universities started their movement from the point of existing potential using readymade training platforms (in most cases borrowed from the Western partners) and adjusting training courses to the technical capacity of the platforms as they can on the level of their competence. This work is done basically by single subject trainers with the help of the University e-centres in the best case but more often individually. The universities that have won international grants for the development of their capacity turned to be in more favourable position. But having developed their infrastructures they turned to be alone while realising curricula methodically. All together with the lack of interdisciplinary competence caused the recreation of the traditional courses edition formally realized by the technical means without any gain in training quality and efficiency. For today we can declare firmly and regretfully that our expectations concerning e-learning investment into upgrading and efficiency of the University education were not materialized.

We consider that the arisen problems could be overcome by the multidisciplinary teams of University fellows on the way of e-learning development by means of simulating the proved models of real training activity based on psycho-pedagogical laws of human memory and thinking functioning. Theoretical relevance of this work concerns discovering science and psychological laws of students' cognitive and personality self-development on the bases of their synergetic interaction with technological training environment. Practical relevance of the work concerns developing innovative metacognitive approach to the education of the new generation of students who are ready to the life and work under the condition of ambiguity caused by the acceleration of social and technological changes in the society.

Aim. Social, educational, scientific and practical significance of the e-learning determined the aim of the work that concerns the empirical investigation and theoretical generalization of the psychological laws as well as the elaboration of psychological-pedagogical principles and innovative technologies of student's efficient cognitive and personality development within e-learning online.

The investigation object deals with psychological mechanisms, determinants, principles and technologies of the student's cognitive and personality self-development under conditions of e-learning online.

The investigation tasks include: 1) formulating hypothesis about the feasibility of the efficient student's cognitive and personality development online provided by simulating developmental environment based on psychological laws of human memory and thinking functioning; 2) developing students' self-development concept based on synergetic interaction with e-learning environment online; 3) creating human-centred model of e-learning online; 4) elaborating research methods of students' self-development under conditions of e-learning.

Methodology of research. Both theoretical (analyses, reflection and generalization of the results presented in scientific literature on the issue) and empirical (observation, experiment, interview, surveys, testing, scaling, content-analyses, expert evaluation) methods were used for the achievement of the research aims. It was used both well-known and original author's methods, tools and techniques: "Technique of cognitive schemes overlay", "Method of personality profile construction", "Matrix of individual development", "Matrix of complex development"; "Learning history", "Learning diary", "Test-survey of personality meta-characteristics", "Self-management matrix – Progress Bar", "Self-evaluation matrix - Coloured Palette" (Sergeyeva, 2009, 2017e, 2017f).

Longitude training experiment that was conducted under real conditions of University education was the bases of the research. Correlation and factor analyses of the data groups introduced the experiment. As a result of correlation analyses there were identified significant positive interrelations between cognitive and students' personality meta-characteristics such as individual sense-cognitive scheme, problem solving efficiency, meta-senses, meta-abilities and meta-qualities of the students (Sergeyeva, 2009). The factor analyses allowed identifying the symptom-complexes that were united into three factors: 1) the factor of interaction between trainee and training

environment – "friendliness" – "hostility"; 2) the factor of orientation diapason – "self-development – surviving"; 3) the factor of behaviour regulation – "responsibility – egocentrism" (Sergeyeva, 2009). The factors determined the developmental impact direction in accordance with cognitive, communicative and regulative functions of the consciousness.

Reasons of the identified interrelations were defined in the course of the training experiment (Sergeyeva, 2009). Independent variable was presented by the training environment that was simulated in the frame of traditional training or e-learning online and provided the development of students' professional, social and existential competence on the bases of sense-cognitive orientation of different range. Dependent variable was presented by the efficiency of students' cognitive and personality self-development.

The level of the researched phenomenon formation was characterized by complex indicator that was measured on three levels: 1) on the sense level – the efficiency of the personality senses development; 2) on the cognitive level - the complexity of the individual sense-cognitive scheme; the metacognitive and subject competence; 3) on the activity level - the efficiency of the subject task solving that is measured on the bases of the fluency, accuracy and completeness parameters; the correspondence of the training actions to the real substantive actions; the rate of automation and integration of the acquired action mode into the individual internal resources in the form of the cognitive, communicative and regulative meta-abilities (such as self-development, synergetic interaction, making decision) and meta-qualities (such as objectivity proactivity, independence, responsibility, creativity, resourcefulness, empathy).

Data of every student's efficiency of solving subject task or tests were readily sent to the zone of training evaluation on STVteam platform immediately in the course of training. There all data were processed on the bases of the formula of self-development efficiency calculation. The measurement of the efficiency was made in units from 0 to 1 by using s-ten scaling with subsequent grading (A-D) in marks considering task weight/complexity. While constructing personality profiles the measurement units of valence, weight, saturation,

completeness, efficiency, capacity and frequency of exposure of students' meta-senses, meta-abilities and meta-qualities were used. Data statistical processing as well as results graphic representation were made on the bases of statistic programmes SPSS 10.0. The original technology of empirical data processing was created for the personality profiles construction. Original techniques "Progress Bar" and "Coloured Palette" were used for self-evaluation online. After mathematical processing the received data were subjected to the qualitative interpretation and the informative generalization.

The experimental investigation was held under condition of real University training during 10 years in the mode of training technology of eco-humanistic self-development, that was investigated additionally for 3 years in the mode of e-learning online. 700 students, trainers and post-graduates of Ukrainian Universities from 17 to 60 years old took part in the experiment.

Training experiment: For longitude training experiment that was organized under condition of real university training all students were divided into 4 groups: 1 control group (K) and 3 experimental groups (E1 – E3).

In the control group K the training was organized on the bases of the subject-centred model in traditional mode without strategic orientation via ready-made knowledge delivered in the format of lectures with subsequent discussion at workshops and practice in the form of subject task fulfilment under control.

In the experimental group E1 the training was organized on the platform MOODLE. It was based on the subject-centred model where all forms of traditional training described for group K were simulated. The otherness concerned lectures in the format of presentations; distance mode workshops; practical task with keys providing immediate feedback in the form of the mark and model answer samples; possibility of students' access to the training material at any convenient time but with the deadlines for work and control.

In the experimental group E2 the training was based on human-centred model: individual sense-cognitive scheme was intentionally developed by means of technique allowing its overlay on the subject

sense-cognitive scheme developed by mankind (Sergeyeva, 2007). The identified gaps were transformed into individual program of training that was realized by the student on the bases of the initial strategic metacognitive orientation (Sergeyeva, 2012) in the subject with the subsequent transformation of the acquired subject action modes into everydayness to provide their automation and integration into student's internal resources. Students passed all stages of the existential circle of self-development (Sergeyeva, 2000) where every training task was perceived as an event. Its sense and the availability of the required resources were analysed for choosing optimal strategy of solution. Successful modes of subject tasks solution were repeated and atomized integrating into the student's internal resources. Trainees passed all steps of the cognition cycle starting from unconscious incompetence via conscious incompetence and conscious competence to unconscious competence.

E2 group training was organized on the bases of psychological mechanisms of self-development (Sergeyeva, 2013a): 1) "mechanism of internal and external activities synergy" that provides the purposeful development of the individual internal sense-cognitive scheme based on training activity design; 2) "mechanism of balancing personality senses – individual resources – external conditions" that provides development and sustainable support of training motives as a driving force of self-development; 3) "mechanism of sense-cognitive orientation capacity" (Sergeyeva, 2013b) that determines efficiency of self-development within orientations to phenomenological, social or existential reality; 4) "mechanism of strategic orientation" that provides optimal organisation of training activity with uninterrupted transition of the previous activity aims to the means of the following activity realisation in the context of the final goal. All this contributes to the involuntary memorization of knowledge in the process of acquisition (Sergeyeva, 1979, 1990).

In the experimental group E3 the training was based on human-centred model on the platform STVteam where strategy described for group E2 was simulated but in the format of e-learning (Sergeyeva, 2018b). Experimental conditions were extremely close to the natural condition of self-development based on existential model. Interactive

lectures specified the strategic orientation to the final goal in the format of the metacognitive knowledge about subject, about cognition, about self. This allowed realizing self-management of the self-development process (Sergeyeva & Turlakova, 1999) in the mode of e-learning online. Giving answers to the questions: "Where am I now?", "Where do I want to be?" and "How can I get there?" students acquired the means of identifying personality senses, individual resources, strategy and optimal for every trainees programme of development in the context of final goal.

In the group E3 the new technical possibilities of e-learning online were used for the realisation of the psychological model of self-development. They are:

1) computer aided system of self-management, self-control and self-evaluation (Sergeyeva, 2017e) with possibility of immediate feedback that works in online mode of communication in the frame of training courses and forums;

2) system of tutorials that allows getting operatively all necessary information via reference in the point of problem origin in the format of presentation, video, drawings, tables, interactive matrix and cross-forms;

3) system of tutors that provides support in various forms: e-tutor (training environment); self-tutor (student with metacognitive competence); personal-tutor (mentor supporting student in distance mode); expert tutor (expert in concrete field of knowledge delivering target coaching and master-classes); social-tutor (social net partner); partner-tutor (group mate);

4) identification of the initial level of trainee on the bases of student's sense-cognitive scheme (Sergeyeva, 2013c) with digital and graphic "overlay" on the target subject sense-cognitive scheme developed by the mankind with operative transformation of the discovered gaps to the individual program of training;

5) individual program of the training in the format of "Progress bar" as a complex instrument that provides: course navigation; computer-aided evaluation of the subject task solution efficiency with graphic presentation of the results; access to the following task if only

the previous task is solved successfully; digital and graphic profile reflecting success in approaching to the final goal (Sergeyeva, 2017e);

6) interactive lectures that specify the strategic orientation in the e-complex in the format of short informative and attractive video presentations with operative access to the materials via reference;

7) interactive matrix that allows exteriorising, step by step development and automation of the internal subject actions (Sergeyeva, 2017d, 2017f, 2017g);

8) mnemo-techniques that provide involuntary memorizing of the vast range of the training materials (Sergeyeva, 2017a, 2017b, 2017c);

9) animation that allows visual presentation of the psychological and subject models in dynamics for understanding their essence.

Results. Empirical investigation of the cognitive and personality development efficiency within traditional training or e-learning online based on subject-centred or student-centred models produced the following results:

- on the sense level the evaluation criteria reflected the development of the personality senses in the frame of the training strategy used. The figure indicators and the growth (given in brackets) of the professional, social and existential senses development made up respectively in the group K – 0.39 (+0.10), 0.38 (+0.03), 0. 37 (0.02); in the group E1 – 0.52 (+0.20), 0.46 (+0.03), 0.45 (+0.03); in the group E2 – 0.61 (+0.30), 0.53 (+0.10), 0.52 (+0.10); in the group E3 – 0.68 (+0.36), 0.66 (+0.23), 0.64 (+0.22). The data proved that subject-orientated strategy (K and E1) did not provide development of the personality senses irrespective of the material presentation mode. Significant growth of personality senses occurred in the human-centred strategies (E2 and E3) with substantial figure indicators increase within e-learning online mode (E3).

- on the cognitive level the evaluation criteria reflected the enlargement of student's individual sense-cognitive scheme (ISCS) complexity within strategy used. The figure indicators and the growth of the ISCS development level (the number of objects and links between them) made up in the group K – 0.48 (+0.11), in the

group E1 – 0.53 (+0.17), in the group E2 – 0.61 (+0.24), in the group E3 – 0.78 (+0.41). The data proved that nearly all strategies provided ICSC development but in the subject-centred strategies (K, E1) both the level of the development and the figure indicators increase noticeably gave way to the student-centred strategies (E2, E3). What is more the figure indicators increase within e-learning online was considerably higher in the human-centred training.

- on the activity level the evaluation criteria reflected the efficiency of the subject task solving as well as the level of meta-abilities and meta-qualities formation as a result of automation of the actions used. The figure indicators and the growth of the efficiency of the subject task solving that was calculated on the bases of the fluency, accuracy and completeness parameters made up in the group K – 0.37 (+0.02), in the group E1 – 0.41 (+0.07), in the group E2 – 0.53 (+0.18), in the group E3 – 0.69 (+0.34). The figure indicators and the growth of meta-abilities such as self-development, synergetic interaction and making decision made up respectively in the group K – 0.40 (+0.04), 0.35 (+0.01), 0.38 (0.03); in the group E1 – 0.47 (+0.05), 0.45 (+0.07), 0.44 (+0.08); in the group E2 – 0.52 (+0.11), 0.53 (+0.13), 0.56 (+0.17); in the group E3 – 0.66 (+0.24), 0.65 (+0.26), 0.67 (+0.27). The figure indicators and the growth of meta-qualities such as objectivity proactivity, independence, responsibility, creativity, resourcefulness, and empathy made up respectively in the group K – 0.47 (+0.10), 0.35 (+0.01), 0.34 (+0.01), 0.35 (+0.02), 0.34 (+0.01), 0.32 (+0.01), 0.32 (+0.00); in the group E1 – 0.49 (+0.12), 0.37 (+0.03), 0.36 (+0.03), 0.37 (+0.04), 0.36 (+0.03), 0.35 (+0.03), 0.34 (+0.02); in the group E2 – 0.61 (+0.26), 0.64 (+0.25), 0.62 (+0.24), 0.53 (+0.17), 0.46 (+0.12), 0.48 (+0.11), 0.49 (+0.12); in the group E3 – 0.79 (+0.39), 0.71 (+0.35), 0.68 (+0.35), 0.59 (+0.21), 0.63 (+0.28), 0.58 (+0.24), 0.56 (+0.21). The data proved that the formation level of meta-abilities and meta-qualities was growing in accordance with the growth of the efficiency of the subject task solving. At that in the subject-orientated strategies (K, E1) this growth was insignificant and practically did not depend on the training mode. But in the student-

centred strategies (E2, E3) there appeared significant growth of the figure indicators within e-learning online.

Discussion. The data obtained as a result of the experiment proved the direct dependence of the developmental effect of training on the model in its basis. In our case we compared the traditional subject-centred pedagogical model with the student-centred psycho-pedagogical model. The findings discovered insignificant influence of the e-learning in the frame of the first model but essential growth of efficiency in the frame of the second one that was reinforced by the new technological features that was not available earlier. It is explained by:

- customized training that was achieved due to the awareness of the personality senses, individual resources and existent conditions that activated the psychological mechanisms of self-development. The activation was technologically supported by simulating natural conditions of self-development in the e-learning environment. The animation allowed discovering the essence of psychological and subject phenomenon visually and in dynamics. The whole process was streamlined by the possibility of the operative identification of the personality senses and individual resources with the digital transformation of the obtained results to the individual curriculum that allowed further monitoring and evaluation of the success in approaching the final goal in the format of graphics and profiles at every step of training activity. This option determined the character and the quality of the subject action formation that showed up system organisation and awareness in the context of personal needs as well as real possibilities of their satisfaction. The initial orientation in the context of the personality senses, available resources and existent conditions determined easy automation by transformation of the successful actions into real conditions of everydayness with their further integration into the internal resources in the form of abilities and qualities. The natural synergy of conscious and systemic actions determined the involuntary memorization of the training materials.

- streamlined training that was achieved due to the awareness of the interlinks, interdependence and interactions of sense, cognitive and activity levels. E-learning increased optimisation by means of

technological support: a) on the sense level due to the step-by-step monitoring of the success in the context of the final goal that caused the enlargement of the sense-cognitive orientation from the sense of surviving and social sense via cognitive sense to the existential sense of self-development; b) on the cognitive level due to the system organisation of knowledge around the essence of the subject and metacognitive amplitude of knowledge (about subject, about cognition, about self) that was supported by the virtual interactive lectures in the attractive dynamic video format with the immediate access to the materials via references; c) on the activity level due to the adequate use of action corresponding to the situation (existent conditions and individual resources) in the context of the personality senses and the final goal that determined the efficiency of successful actions realization and automation that was technologically supported by the interactive matrix that allowed exteriorising and step-by-step developing internal subject actions providing high efficiency subject task solving. The automation and integration of the subject actions into the internal resources in the form of abilities and qualities were supported by the interactive mnemo-techniques that provided the involuntary memorizing of the comprehensive training materials. System optimisation on the sense, cognitive and activity levels determined the following qualities of the actions: system organization, awareness, originality, depth and stability. Synergy of levels determined the acceleration of the qualities formation by means of actions automation on the bases of metacognitive competence: knowledge of self-development process determined the formation of objectivity and independence; knowledge of self-development psychological mechanisms and self – proactivity; awareness of interlinks and interdependence of sense-cognitive-activity levels – creativity, resourcefulness, responsibility and empathy.

- proactive training that was achieved due to the awareness of the process of purposeful self-development that supported the efficient transformation of the acquired mode of actions to the everydayness that turned to the long-life educational self-development polygon. Technical support of the proactivity was

provided by the self-management, self-control as self-evaluation facilities with immediate feedback. This provided conditions for the independent activity in the frame of the individual sense-cognitive orientation. Tutorials and tutors' systems that corresponded to the individual needs supported proactivity by providing the formed actions with the qualities of awareness, system organization, depth, originality, involuntariness, ability for practical transformation (Sergeyeva, 2014).

Every principle allowed developing definite set of personality qualities (Sergeyeva & Demidyuk, 2012) in their specificity that under simultaneous realisation provided the completeness and the integrity of all qualities that determined the synergetic effect. All these proved the advantage of personality holistic development in its integrity on the bases of modelling existential situation of self-development in interaction with the surrounding world as a condition of self-development synergetic effect.

Our result comparison with other investigations of the problem has definite complexity because in modern scientific literature we did not meet the psycho-pedagogical approaches to the system organization of e-learning online. In most cases even very authoritative authors (Clandfield & Hadfield, 2017; McCarthy, 2016; Donald, 1993) propose quite efficient set of tools or packages of communicative strategies but not system vision of e-learning methodology. This secrecy of investigation can be explained by their commercial nature. That is why we can judge about existing directions, trends and approaches to the problem investigation only by the implicit features of the concrete e-courses that are proposed today on the market of education services.

To make our comparison more concrete we selected the most popular interactive programmes of English language learning: ALISON, Babbel, BBC Learning English, Canvas Network, Coursera, Duolingo, Easy Ten, edX, FluentU, Flashcards Anki, FutureLearn, Lingualeo, MOOEC, Open Learning, Udemy, Saylor, World Education University – WEU. Irrespective of the orientation to the grammatical knowledge acquisition (ALISON, MOOEC, edX, Udemy, Open Learning, Canvas Network) or to the development of

the speech skills (FutureLearn, edX, Coursera, Saylor, World Education University – WEU) all of them are unified by ignoring students' individual sense cognitive scheme in the context of the proposed knowledge or skill.

In most e-courses the exclusively practical focus is predominating. This approach is based on the conception of language acquisition by the child by means of imitation without considering already existent speech experience and developed thinking. This kind of universalization has commercial explanation, when market promotes the technologies developed by the English native-speakers who have difficulties in considering the peculiarities of the language and speech experience of those whom they teach. This kind of education is organized around the communicative situations (BBC Learning English, Babbel, FluentU). Exclusively situational approach destroys system knowledge about subject that makes unavoidable memorizing huge amount of lexical material that has exceptional orientation to the voluntary memorizing of the material (Easy Ten, Flashcards Anki). It is a matter of common knowledge that voluntary memory yields the palm to the involuntary one when efficiency and sustainability is concerned. The lack of system organisation and awareness as conditions of the efficient involuntary memorizing is also explained by the inheritance of the popular in the 70-th IMPACT approach when curriculums in the American primary schools were developed spontaneously in accordance with the pupils' interest that developed the motivation but destroyed the system of knowledge.

In the best case the e-courses (Lingualeo) propose curriculum on the bases of testing subject knowledge but this programmes are focused on narrow knowledge or skills out of holistic conception of the subject or the personality of the student. What is more the motivation system is orientated to the external incentive in the form of Young Lion feeding (Lingualeo), Green Owl call (Duolingo), bonuses, prises, premium-accounts and even study-bucks (iLearn), that in no way is connected with the development of the internal motives that provide sustainable cognitive and developmental effect. So we can say with confidence that creators of the e-courses

proposed by the market of educational services do bot consider the achievements of the psycho-pedagogical science.

Conclusions. New technologies allow considerable increase of e-learning developmental effect if e-courses are based on student-centred model that consider psychological laws of trainee's self-development.

For achieving developmental effect the design of e-courses should be realized by the multidisciplinary team (Sergeyeva & Barber, 2016; Sergeyeva, 2018a) including experts in the field of IT, e-learning, pedagogical psychology as well as subject trainers and proficient. The creation of really developmental training environment should be based on the understanding psychological laws of purposeful cognitive and personality self-development. Simulating natural process of self-development starts the work of psychological mechanisms that determine direct link with reality, high efficiency and natural synergy of the student's development under conditions of e-learning.

The efficient e-learning is possible if the place of the object of developmental impact is occupied by the personality of student in its unique integrity. Under condition of training this impact is realized via student's individual sense-cognitive scheme that reflects the acquired subject objects and their links that are represented in the consciousness on the sense, cognitive and activity levels. The exteriorisation of the individual scheme is possible by means of its overlay on the scheme of the studied subject that allows identifying "the gaps" to develop the customized individuated curriculum.

The efficiency of the cognitive and personality development of the students in the frame of e-learning is determined by the mode of training activity that in their turn are determined by the amplitude of the sense-cognitive orientation in the training environment. The widest orientation is provided within subject where its phenomena are deducted from its essence on the bases of metacognitive knowledge about subject, about cognition, about self.

Under metacognitive orientation in the training subject: a) on the activity level the efficiency of the activity mode is growing in accordance with the indicators of system organisation, awareness,

depth and task solving efficiency measured on the bases of the fluency, accuracy and completeness parameters; b) on the sense-cognitive level the individual sense-cognitive structure is developed with increasing the number of its objects and interlinks. At the same time the qualitative transformation of the motives that is important for e-learning online is taken place: the external incentives of cognition, development and evaluation are transformed into internal ones of self-cognition, self-development and self-realization. The first two motives are converted into the meta-motives of sense search and self-identification, which simultaneously are perceived as the motives of surviving, quality of life and sense of life.

Under metacognitive orientation the synergetic effect of training appears. It is determined both by the intrasystem (personality in its integrity) and intersystem (students interaction with the training environment) synergy that comes up and acts in accordance with the principle of chain reaction on the sense, cognitive and activity levels. The initial strategic orientation to the final goal is organizing the intermediate aims into a system where the results of the previous actions or the qualities that are specific for the previous aim are becoming the means of the next goal achievement. Individual resources that are growing in a system way are creating new conditions of enriched resources interaction with the training environment at every stage that determines synergetic interaction development.

The growth of synergetic effect of the target self-development is determined by the synergy of customization, streamline and proactivity principles. Modelling of the natural process of self-development in the training launches the work of the natural mechanisms of self-development that determines its natural synergism under conditions of training. Realisation of the customization increase the developmental effect due to the synergy of existential and cognitive experience that removes local and temporal limitation without loosing connections with reality. The proactivity principle provides synergy of the activity modes due to the metacognitive awareness of self-development laws because integrates in itself the ability to use this knowledge. Every principle

provides development of the definite set of personality qualities in their specificity. Under simultaneous activation of all principles the completeness and the integrity of all qualities is provided. This situation determines the synergetic effect providing personality and cognitive resources for target optimal lifelong self-development under real condition of everydayness.

The investigation prospect may concern principles for multidisciplinary creation of e-courses aimed at the efficient cognitive and personality development of the students who are ready for the life and work under the conditions of ambiguity caused by social and technological changes in the society.

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