

Dual Nature of Students' Knowledge Formation in the Pandemic Period: Pedagogical and Psychological Aspects

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Abstract: The paper focuses on pedagogical and psychological facets of students' knowledge formation impacted by the coronavirus pandemic situation worldwide. It was found out that the emergent transition to online education was mostly fruitful for the development of new learning technologies, but at same time many students experienced frustration and uncertainty, studying independently; some lecturers were not ready to refuse from traditional frontal teaching methods. Theoretical analysis was applied to study classic and modern scientific works on the nature of the phenomenon of knowledge and its formation. Comparative analysis of the latest publications on this topic revealed that actual pedagogical approaches stated the importance of learners' active participation in the interactions and interrelations within the system of the learning process and the relevance of the socio-cultural context of new knowledge presentation. Pedagogical observation and expert evaluation enabled authors' exploring Generation Z students' cognitive modes and psychological background, featured by practically oriented motivation, clip thinking, ability for multitasking, prevailing involuntary attention and weak memorization, preference for visual presentation of information. Theoretical synthesis and compilation implementation enabled working out practical recommendations for intensifying the process of knowledge formation of Generation Z students. The outcomes of the study were used to modernize an e-course "Methods of Teaching in Higher Education Institutions", so that it met contemporary demands.

Keywords: *Generation Z students; knowledge formation; online education; pedagogical approach; psychological features.*

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1. Introduction

Humankind has befallen COVID-19 pandemic as a global test for efficiency and expediency of all the aspects of the society's functions, including the upbringing of young generations. Lecturers and students had to continue their academic activities under the emergency conditions of the direct life threat adhering the social isolation and the social distance.

The pandemic has caused significant challenges for the higher education system in Ukraine and forced university instructors to develop new approaches to online teaching. While working at the content of the e-courses on different academic disciplines, educators had to rethink the fundamental basics: What form of educational process is preferable in the current situation? What teaching methods are relevant in emergent conditions? What knowledge has a priority value for students to focus on? What role should perform a teacher, a knowledge generator or an educational facilitator? etc. Most of these questions are still rhetoric and disputable. Elaborating the e-course "Methods of Teaching in Higher Education Institutions" aimed at teaching Master students of Sumy National Agrarian University (Sumy, Ukraine) to conduct the educational process as lecturers of their profession-oriented disciplines, the authors attempted to find the answers to them.

The goal of the paper is to define the essence of the concept of "knowledge", psychological and pedagogical backgrounds of its formation, that are necessary to modernize the content of the e-course "Methods of Teaching in Higher Education Institutions" according to the demands of pandemic period. The objectives of the paper are to examine and analyze classic and latest scientific works on knowledge formation and single out the peculiarities of modern pedagogical approaches to knowledge formation; to study psychological researches on specific features of Generation Z students' cognitive activities; to compose the methodological recommendations for Master students to enable their managing with challenges of future teaching.

2. Literature review

Knowledge formation as well as its transferring, mastering, augmentation and application is a key point of the educational process in a higher education institution. It is a set of intellectual creative learning activities, carried out by students and academicians aimed at the professional improvement and the harmonious development of their personalities. The

situation of global disaster, such as the pandemic of COVID-19 that the whole humankind has been facing recently, demands the primacy of new knowledge creation because the consumption of ready-made information cannot be sufficient for the training of future professionals, who are able to fulfill different tasks under the unpredictable pandemic conditions (Hanaba et al., 2020).

Knowledge in education, being a means of discourse construction at the present stage of the social progress, is not solely a continuous discovery of the nature of phenomena, but contains the system of human ideas, intentions, beliefs and affirmations. It is used to undertake a purposeful practical activity and it can be tested in real circumstances to verify its veracity (Netreba et al., 2020). Currently modern scholars have witnessed knowledge transformation under the influence of virtual and digital tools, “determining a strong exteriorization of the knowledge system in relation with the knower”. Present structure of knowledge consists of the bits of information, that cannot be acquired for the idealistic sake only. Knowledge and information become valuable if a learner is inclined to apply them in a new production, taking into consideration the principle of performativity (Stanciu & David, 2020).

Contemporary stage of knowledge evolution is presented by numerous technologies, known as artificial intelligence, that can perform human thinking, process complex information, come to independent conclusions, and to be engaged in thoughtful and coherent dialogue. Nevertheless, scientists still doubt if a human is already psychologically, intellectually and emotionally prepared to perceive such innovations, even as a practical instrument for self-education and self-development (Hanaba et al., 2020). Scholars insist that ICT are the inseparable elements of the society nowadays. At the same time, artificial intelligence technologies are supposed to have anthropological meditation on the post- and the trans human state (Sandu, 2019). So it is obvious, that the objective features of pandemic and post-pandemic reality require a gradual transition from usual educator-centered and lecture-based frontal learning towards primarily learner-centered blended educational process, containing work in groups, collective projects, disputes, hands-on learning activities, and mostly lectures online that should replace traditional lectures (Zhu & Liu, 2020).

Online education has long been reputed as an important source of information and knowledge, competing the traditional classroom setting. But, as it has been already proved, that only fully concentrated learners are

able to grasp and comprehend new and complex ideas, therefore learners' self-discipline, diligence, and responsibility are the obligatory prerequisites of the efficient online learning (Chang, 2020). Educators insist on developing students' feeling of connectedness and psychological proximity for their successful acquiring higher order thinking skills and knowledge from online academic resources and digital learning platforms. They noted that cognitive styles of students need also to be adapted for the peculiarities of online learning, as well as digital diagnostic skills of lectures, so that they can get assured if transferred knowledge has been comprehensively gained by students (Gokuladas & Baby Sam, 2020).

Thereby, the analysis of the latest scientific works showed that the circumstances connected with global pandemic had created a hostile environment for students, who felt abandoned in their educational process after the immediate transition to the online learning, experiencing pressure, panic and uncertainty. Many lecturers complained that they could not properly control students' achievements, progress or weak points in learning material acquisition (Molea & Năstasă, 2020).

So, it was decided to explore the nature of knowledge formation from pedagogical and psychological positions for finding an appropriate methods taking into consideration peculiarities of pandemic and post-pandemic period.

3. Methods of the research

The research methodology involved theoretical analysis of the scientific literature on the issue of study: the phenomenon of knowledge, pedagogical and psychological aspects of students' knowledge formation.

Comparative analysis was used to single out and compare the essential characteristics of latest pedagogical approaches to learners' knowledge formation. Pedagogical observation and expert evaluation methods were applied by the authors to study modern students' cognitive modes.

To create an e-course "Methods of Teaching in Higher Education Institutions" on the basis of the findings of the theoretic study and to compose practical recommendations for the organization of students' knowledge formation process theoretical synthesis and compilation were used.

4. Results

4.1. Pedagogical aspects of knowledge formation online

Knowledge is one of the most uncertain, ambiguous and even contradictory phenomena. The relationship between knowledge and reality is multi-level and complex, both in terms of the history of scientific research and in terms of the process of personal development. Elementary knowledge due to biological laws is inherent even in animals; it functions as a necessary basis for their livelihood and the implementation of behavioral acts. In the broad sense, knowledge is information that a person acquires about the objective world and himself/herself in the process of cognition and self-cognition (Hunt, 2017).

Pedagogy regards knowledge as a proven result of examining the reality, its correct reflection in human thinking; possession of experience and understanding which are correct both subjectively and objectively; a base on which it is possible to construct judgments and conclusions that seem reliable enough to be revealed as knowledge. The following essential features of knowledge were stressed: consistency, the possibility of empirical verification, logical validity (Smolen et al., 2016).

For a long time, the dominant type of education had been a knowledge-oriented one. Knowledge had been represented in it by an external educational material as a crucial element of learning. Cognitive activity was directed to students' memorizing, applying in practice and developing ready-made knowledge. It was believed that the depth of understanding of a certain fragment of reality by students was proportional to the amount of material that had been studied by them (Rusyaeva, 2014).

Progress in virtualization and ICT has transformed the process of getting knowledge into a certain business or a branch of an industry that promotes various social and educational phenomena. Moreover, the educational process nowadays does not exclusively take place within educational institutions; it is open and accessible, due to the application of digital facilities. But even in the current situation of emergent distant learning, some lecturers persist in being knowledge leaders and using traditional frontal teaching technologies that keep students' position as knowledge-consumers, passive participants in the educational process (Molea & Năstăsă, 2020).

Nevertheless, progressive student-centered approaches and technologies have already been developed and adapted to online teaching

and distance learning. They enable students' active role in the educational process through their continuous interaction with the academic environment by means of digital learning platforms. The student-centered pedagogical approach suggests that students operate existing digital academic databases for the creation of their personalized knowledge bases on a topic under review; it also involves different kinds of individual and collaborative learning and reflective activities (Naamati Schneider & Meirovich, 2020).

Another trendsetting pedagogical approach aimed at improving quality of the educational process is the social constructivist approach adapted for the e-learning environment. It was originated to avoid the drawbacks of simply delivering the information to students; on the contrary, the learners were involved in new knowledge production by ameliorating an academic environment. This approach points out the relevance of socio-cultural context as an inseparable element of knowledge acquisition, proving that "learning and knowledge must be presented in the prevailing socio-cultural context" (Assante, 2020).

Being regarded from the system approach, all elements of the educational process (learners, lecturers, knowledge) are in the continual process of changes. Learners acquire knowledge and become professionals, lecturers learn more about learners and alter the methods of interaction with them; the discipline is being developed by scientists and requires constant updating. The structure of the system of knowledge formation consists of interrelationships that should be two-sided and mutually influenced; otherwise, the emergent effect of it weakens. It means that the material of the discipline must be structured, relevant, combine theoretical and practical knowledge in order to provide its emergence factor; students need to be fluent in the material of the discipline, feel its logic, specialization, and understand its place in their future profession; lecturers should constanly improve their teaching techniques and methods of interaction with learners (Akhmedianova & Pishchukhin, 2016).

The outcomes of the theoretical research are resumed in the Table 1.

Table 1. Modern pedagogical approaches to knowledge formation

Source: Authors' own conception

Approach	Knowledge formation definition
Knowledge-oriented	Students are passive consumers of knowledge. Understanding is proportional to the amount of

approach	material that had been studied by them
Student-centered approach	Students create their personalized knowledge bases on a topic under review involving different kinds of individual and collaborative learning activities
Social constructivist approach	New knowledge, presented in the prevailing socio-cultural context, is acquired by learners who ameliorate an academic environment
System approach	Knowledge formation is a result of the two-sided and mutually influenced interrelationships within the system of an academic process

So, it was found out that the accumulation and memorization of learning material is not sufficient for students' training. Students must be actively involved into the process of knowledge formation; its socio-cultural context needs to be taken into account, as well as interrelations within the system of the learning process.

4.2. Psychological aspects of knowledge formation by Generation Z students

Psychological category of "knowledge" is interpreted as an ideal psycho-mental structure in the inner world of an individual consisting of rationally organized information blocks. It is constructed as a result of constant influx of external impressions from which the above-mentioned blocks are spontaneously or purposefully formed. Human cognitive activity initiates the formation of knowledge that exists in the form of mastered concepts, laws, principles, patterns, mechanisms, and mental facts. Sometimes knowledge is viewed as a content of memory, thinking and imagination (Nagel, 2013). Recently, proponents of contemporary gestalt trends have formulated knowledge formation as learners' perception of integral blocks of information that causes a qualitative altering in mental patterns and results in the essential restructuring in the academic process format. It engages not only the dissimilation of new knowledge, but also learners' ability of performing multiple cognitive modes, changing one gestalt into another, that implements an internal multi-variance of reflecting and perceiving the objective reality (Niati, 2017).

The scientist V. Davydov noted that in frames of the educational process knowledge is developed due to the learning vector, directed from partial to general, i.e. by induction. This generalization is formal-logical: by

comparing objects and ideas about them with the identification of the same general properties. But educational activity of students cannot consist solely of description, comparison, classification of mainly natural and visual means. Analytical activities only empower the highlighting of the essential features of an object itself and the internal connections of its aspects. Thus, knowledge, in contrast to information and empirical data, becomes the most effective way of mental and psychological development of a student (Davydov, 1986).

Nevertheless, currently, educators need to consider the specific features of modern students who belong to Generation Z. The researchers have noted that they are distinguished from previous generations by clip thinking. It is characterized as a process of reflecting many different properties of objects, without taking into account the connections between them (Howe & Strauss, 2000). Clip thinking is formed through the constant interaction with Internet content. It leads to the inability of young people to analytically perceive information, systematically reflect on it and, accordingly, make conclusions. Such cognitive mode is characterized by the fragmentation of the information flow, illogicality, complete heterogeneity of incoming information, high speed of switching between parts and fragments of information, lack of a holistic picture of perception of the surrounding world (Campbell, 2015).

Modern students are accustomed to the information accessibility. Due to the ease of searching for information on the Internet, in the modern world the importance of preserving it in memory and the role of memorization has decreased. Instead, Generation Z learners are eager to perform multitasking algorithms. But, of course, the price to pay for multitasking is absent-mindedness, hyperactivity, attention deficit, lack of concentration. Visual imagery in the form of video is their primary method of receiving information as a result of preference for visual symbols to the logics and determined delving into text (Bubich et al., 2016).

Observing their students' cognitive processes in general, the authors have also noted the following tendencies. Firstly, it was the reduction of the information processing level. To assimilate information, the students used operations that did not require deep processing: visual representation instead of analysis and abstraction, search and copying instead of structuring for the purpose of memorization, etc. Secondly, the predominance of the involuntary attention over the voluntary one, changes in long-term memory, the difficulty of voluntary memorization, etc.

In the process of pedagogical observation, it was admitted that the students expected to be motivated to gain knowledge and to be presented with knowledge in an interesting and exciting way. The value of education had to withstand serious competition with other values that are significant for young people, so it was necessary not only to get them interested, but also to give them a clear understanding of how the material of the lesson could be used in professional activities or in social life. Generation Z learners spend a lot of time being engaged in digital communication, so it has affected their sphere of in-person communication skills. They have weak tolerance for delays in “knowing” the results of their learning activities and need an immediate feedback from educators (Hernandez-de-Menendez et al., 2020).

The outcomes of the theoretical study and the pedagogical observation are presented in the Table 2.

Table 2. Peculiarities of Generation Z students' cognitive modes

Source: Authors' own conception

Essential features	Generation Z students' characteristics
Motivation	Young people are motivated to acquire knowledge by clear understanding of how it can be used in professional activities or in social life
Clip thinking	Young people' cognition is featured by inability to analitically perceive information, fragmentation of the information flow, etc.
Multitasking	Cognitive activity of young learners is characterized by their eagerness to perform various algorithms simultaneously
Attention	Most Generation Z students possess hyperactivity, lack of concentration, the predominance of the involuntary attention over the voluntary one
Memorization	Generation G learners' memory is mostly short-term and involuntary, as the role of memorization has decreased in the modern world
Presentation	The preference for visual presentation of new knowledge is prevailing over the determined elaborating of text

So, the study revealed, that the modern students who belong to the Generation Z, possess distinctive cognitive features that influence their knowledge formation process. Among them: practically oriented motivation, clip thinking, ability for multitasking, prevailing involuntary attention and memorization, preference for visual symbols to text. Educators need to find ways to benefit from such peculiarities for the efficient knowledge formation.

5. Discussion

Requirements of life under the conditions of lockdown have changed traditional paradigm of education by installing the new correlations between phenomena of knowledge and ignorance, the known and the unknown, worth to be known and of no importance to know (Verburgt, 2020). Since the beginning of the quarantine the training of future specialists at Sumy National Agrarian University has changed. The academicians have actively implemented online learning, using e-courses on the platform Moodle.

The outcomes of the theoretical study were embodied in the creation of the e-course “Methods of Teaching in Higher Education Institutions”. It was composed for Master students, who obtain the right to teach profession-oriented disciplines in vocation schools, colleges after the graduation of university. Moreover, the study has allowed pointing out certain recommendations to enable future teachers’ of profession-oriented disciplines planning and organizing educational process both online and face to face; creating the learning content for e-courses; promoting cognitive processes and supporting knowledge formation of their learners:

1. Motivation of students to gain knowledge needs to be supported and determined. Students should be motivated to understand the internal logic of the discipline, gain knowledge and structure it into clusters bearing in mind the following knowledge components: “I know what” (information about the content of their knowledge and ignorance); “I know how” (information about the learned algorithms concerning the ways of formation, development and transformation of knowledge); “I know for what purpose” (understanding the meaning of information and activities to obtain it); “I know” (self-determination of this knowledge and relevant information).

2. Learning material should be presented being installed into the socio-cultural background. Knowledge reflects many motivational-semantic, value factors and target dependencies, which are the key for

discovering and understanding the subjective world of a human. Knowledge can hardly be fully acquired if the above mentioned factors are not considered depending on the conditions of human life, on how its interaction with nature and society is organized (Fomenko, 2016; Iliescu, 2017).

3. The crucial point of knowledge formation nowadays can no longer be based on memorization. Any information can be accessed instantly, due to the modern advances in technology. Students should not overload their brains with useless knowledge, the main percentage of which, as practice shows, is not used later, but their mental reserve should be released and reoriented to the development of their abilities to think, analyze, argue and eventually make the right decisions (Bilotserkovets & Berestok, 2019; Kaku, 2015).

4. Students need to be encouraged to take initiative in their studies. A learner should be an active participant of the educational process. Modern scholars have stated that the acquisition of knowledge is a continuous process of the reconstruction of experience. The source of knowledge is not in factual disciplines, but in the social and individual activities of a learner. The content of education is presented in the form of interdisciplinary systems of knowledge, the assimilation of which requires students to make collective efforts of problem-solving, practical activities reconstruction, gamification of classes, individual learning independence development (Fomenko, 2018; Weinstein et al., 2018).

5. Positive feedback to students' learning activities should be constantly provided by instructors. Academicians have to be engaged in firm mentoring relationships, though their boundaries and availability need to be clearly discussed with students. Favorable environment for honest discussion provides critical interactions between students and academia, enables students to voice their opinions and encourages them to more analytically study the subject (Dziuban et al., 2018; Van Kesteren et al., 2018).

6. Visual methods of providing information are preferable. Combining words and images occurs a powerful learning impact, especially when the words and images become significant by comprising previously mastered knowledge. Efficient learning revision is mostly visually triggered. As visual representation provides actual triggering of the full memory, so the mastered knowledge transfers from Working Memory into Long Term Memory. It is necessary to provide students with numerous visual materials, such as: illustrations, infographics, diagrams, presentations. Timelines or sketching work well for creating notes for students' learning material

revision, as they facilitate the ability of students to understand the relevance of a whole to its various parts and foster their comprehension (Ausubel et al., 1978; Bilotserkovets, 2019).

7. ICT are vital for Generation Z students' knowledge formation. Generation Z students' clip thinking presupposes their perceiving information fragmentarily, preferably with pictures and abstracts. Reading classic textbooks becomes more and more ineffective every year. Therefore, the educational process can be transferred into digital space where it is possible to support new knowledge comprehension with websites, podcasts, simulations, interactive tutorials on YouTube, Internet-based educational game and links to reliable sources on the Internet. The diagnostics and control of mastered knowledge can be efficiently performed with multilevel verification training and attestation tests online (Hopkins et al., 2018; Philip & Garcia, 2016).

So, the actual conditions of life in the pandemic period demand a major diversion from traditional methods of teaching and communication in the academic environment. The outcomes of the theoretic synthesis revealed recommendations for sustaining the efficiency of knowledge formation process by taking into account the achievements of modern pedagogical approaches, created for emergent learning, and psychological peculiarities of Generation Z learners.

6. Conclusion

The pandemic and post-pandemic society requires from academicians to carry through crucial changes in higher education, such as transition towards student-centered learning activities, implementation of educational digital platforms and blended classroom system, sorting out important knowledge according to its emergence factor and the principle of performativity. It was revealed that cognitive styles of students, as well as teaching and diagnostic approaches of lecturers, also need to be adapted to the peculiarities of online learning.

In order to remain in demand in the age of artificial intelligence, young people have to constantly learn, acquire new skills and be flexible in changing their activities. Modern students' psychological peculiarities, as representatives of Generation Z, cause educators to refuse from knowledge formation modes, based on memorization. E-course "Methods of Teaching in Higher Education Institutions", created on the basis on the finding of this theoretic study, is vectored to Master students who need to be aware of the importance of motivation, specific learning material presentation, ICT

implementation, proving positive feedback and fostering learning independence of learners when they plan educational process and create content for profession-oriented e-courses.

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