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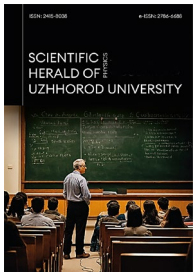

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Exploring heutagogy, knowledge management, and rhizomatic learning approaches in Master's degree programs

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Abstract

Relevance. The digital transformation of education has necessitated a shift towards heutagogical principles in postgraduate programs. Even before the pandemic, theories about digital natives and heutagogy pointed towards new directions in education driven by digitalization.

Purpose. This study aims to synthesize the emerging paradigms of Education 3.0 and 4.0 in relation to knowledge management concepts for training master's students. It also evaluates students' perspectives on the principles of Education 3.0 and self-directed learning.

Methodology. A questionnaire with two sections was administered to 149 master's students across four universities in Kazakhstan.

Results. Understanding heutagogy as a self-determined learning theory can cultivate a new generation of professionals ready for the knowledge economy. Heutagogy nurtures this phenomenon of a globalized knowledge marketplace. The theoretical portion summarizes approaches to redefining learning and learner identities by connecting digital disruptions to transformations in learning and thinking.

Conclusions. The practical component examines Master's students' evaluations of heutagogical principles. Future plans include developing Massive Open Online Courses (MOOCs) on heutagogy and Education 4.0.

Keywords: education; distance technology; heutagogy; digital change; self-development.

Introduction

The massive shift to mixed and online learning as a result of the pandemic is leading to a rethinking of pedagogical theory, the promotion of new concepts of Education 3.0 and Education 4.0, and the need to develop rhizomatic thinking in university students. The digitalisation of education contributes to the rethinking and gradual transition to heutagogical foundations in postgraduate education and to pyragogy in postgraduate education. What are these new approaches? What are the differences between Education 3.0 and Education 4.0? How do students of postgraduate education – Master's degree in

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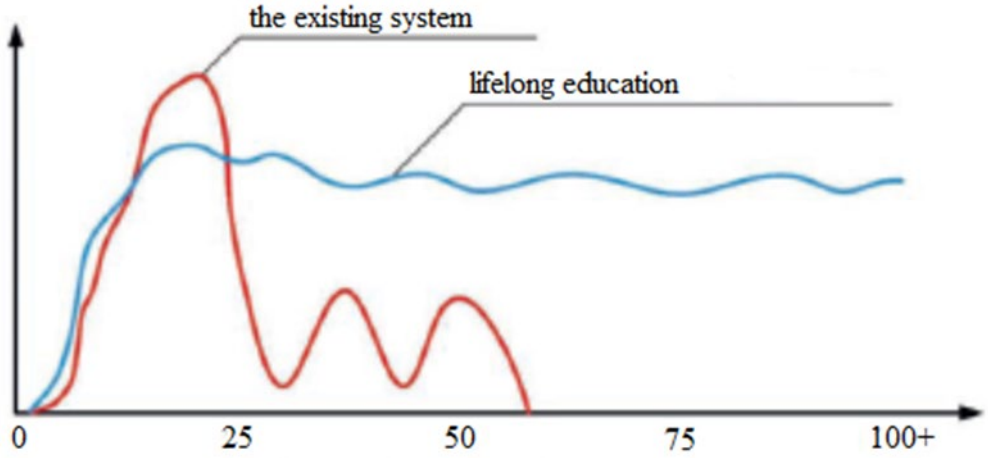
particular – perceive the new approaches to self-education? Behind the external changes, there is a profound shift from transferring ready-made knowledge to the concept of "knowledge and information management". The preconditions for the generalisation of new development trends in education even before the pandemic were the theories of the digital generation and the heutagogy and digitalisation of education. The pandemic intensified and accelerated this process. As assessed by Y. Tazhigulova, A. Artykbayeva, A. Arystanova [1], in Kazakhstan before the pandemic only 38.8% of teachers had experience using distance learning technologies, although almost 80% of teachers have above-average computer skills. In Europe, according to S. Thorvaldsen and S. Madsen [2], 60% of respondents did not use online learning before the crisis and 95% now believe that the COVID-19 crisis was a point of no return for education and learning technologies. Thus, the pandemic has greatly accelerated the massification of distance and blended learning, and not all students will want to return to face-to-face learning, as U. Sidhi Menon and M.V. Unni [3] write.

M.R. Prensky [4] calls the new generation "digital natives" and justifies a partnership approach to learning for them. Other scholars call schoolchildren and students born after the 1990s the emergence of the Internet – the digital generation, the social and digital generation [5], Generation Z or Next [6]. According to M.R. Prensky [4], it is important to shift the specificity of students' learning towards finding, analysing, and presenting content using multimedia. Previously, it was already mentioned about the specifics of the digital generation, the shift in emphasis from "knowledge reproduction" to "knowledge, how to find knowledge" [7; 8]. Nowadays, the load on cognitive processes is changing in education: from memory loading to thinking development, which is similar to B. Bloom's levels – from (knowledge/understanding/application) to (analysis/synthesis/evaluation). And this is characteristic not only for higher and postgraduate education but also for school education. The knowledge society, the constant increase in knowledge and information is changing the paradigm of education to "lifelong learning", "life lasting learning". V. Bolgova, M. Garanin, E. Krasnova, L.V. Khristoforova [9] has visually constructed such a trajectory of transition from the existing education system to "lifelong learning", which clearly demonstrates the importance of self-education in professional life (Fig. 1). In fact, it is about eutagogical approach, Education 3.0 [10], and some authors refer to it as Education 4.0 [11].



Source: developed by the authors

The aim of the study is to summarise the new direction of Education 3.0 and 4.0 in conjunction with the concepts of information management in the training of Master's degree students and their evaluation of the principles of Education 3.0 and self-development.

Materials and Methods

In the theoretical part, the study will summarise approaches to rethinking learning and personal development of the learner, connecting digital change with profound changes in learning and thinking. There is no unequivocal attitude towards the new trends in the pedagogical environment, but there is an understanding that significant changes are taking place. In the practical part, the Master's students' evaluation of the principles heutagogical approach will be considered. In the course of the research, based on the theoretical foundations of heutagogy, the authors developed a questionnaire for Master's degree students. Previously, the first series of the study was conducted [8]. The choice of this category of students is justified by the fact that they have more clearly formed awareness and self-learning strategies. Master's degree students have completed their undergraduate degree, where they have mastered credits which include a high percentage of independent work. According to the Bologna Process Guidelines for using of European Credit Transfer and Accumulation System [12], the student-centred learning paradigm applied is related to increasing student autonomy and self-reliance in the learning process. There were 2 blocks of questions in the questionnaire: (1) questions on awareness of self-education and self-development system, (2) questions on Master's degree students' attitude to heutagogy. The survey involved 149 undergraduates from four Kazakh universities – Al-Farabi Kazakh National University, Abai Kazakh National Pedagogical University, M. Auezov South Kazakhstan University, South Kazakhstan Pedagogical University.

Results and Discussion

The concept of "heutagogy" was introduced by S. Hase and C. Kenyon in 2000. Heutagogy is a "network-centred theory" based on connectivism [10], reflexivity, and metacognitive skills. According to L.M. Blaschke [13], heutagogy as a pedagogy of "self-determined learning" and self-education takes advantage of the possibilities of the internet, can be applied with distance learning technologies, and will be the basis for the digital age of teaching and learning [14]. L.M. Blaschke [13] also notes that heutagogy and distance education have some close "key attributes, such as learner autonomy and self-reliance, and have pedagogical roots in adult teaching and learning". That is, heutagogy as a theory of "self-determined learning" develops andragogy as a theory of adult education. For teachers, the differences between classical pedagogy and new approaches are clear. In classical pedagogy, characteristic of the 17th and the first half of the 20th century, the teacher is the leader of the learning process and the student is a a subordinate child, not an independent learner (Education 1.0). Conventionally, the teacher is the subject of the learning process and the learner was the object influenced by the teacher. One can think of the classic comparisons of the child as a "blank slate" (tabla rasa), a "filled jug" of knowledge and other metaphors.

In pedagogy 2.0, the child acts like a subject or a small partner in the learning process who can be motivated, "fired up" to learn; in andragogy also understood as Education 2.0, the adult learner has a sustained interest in the educational content, self-motivated learning, developed cognitive skills. Here the learner acts as a subject of learning, as a partner in the interaction. [15]. The understanding of "version 2.0 pedagogy" by analogy is related to the development of Web 2.0, when the web has enabled feedback, user evaluation of events and processes, and virtual communication capabilities. Heutagogy as Education 3.0 further autonomises the learning process for the learner since the learner initiates the learning process themself, chooses the methods and means of learning, the learning environment, courses (i.e., educational content/resources), self-controls the process, seeks facilitation themself if they fail with the content elements. Thus, from "pedagogy → to andragogy → heutagogy" (PAH) the learner's autonomy in the learning process and proactivity increases. M. McAuliffe [16] suggested the following principles of heutagogy:

- knowing how to learn is the key skill;
- teachers are more focused on the teaching process rather than the content of education;
- learning goes beyond the specific discipline;
- learning takes place through self-selected and self-directed action.

Other authors, in particular L.M. Blaschke [17] and S. Hase have identified 5 principles of heutagogy, and N. Agonács and J.F. Matos [18] updated them: learner-centred and learner-defined learning; personal capacity development; self-reflection and metacognition; non-linear learning; the PAH continuum principle. The analysis and comparison demonstrate that the principles of the two lists are formulated from different perspectives of heutagogy, and complement each other. The first list is formulated from the perspective of the teacher, emphasising the cognitive approach; the second list is formulated from the perspective and for the learner here the humanistic approach to education is clearly expressed. At the same time, some of the principles flow into each other. For example, the first principle in the first list, "knowing how to learn is a key skill", is connected to the third principle in the second classification, "self-reflection and metacognition", because through self-reflection and metacognition knowledge and strategies for self-learning are formed. The fifth principle of the first list overlaps with the first and second principles of the second list and emphasises the humanistic potential of learning.

Consider the last principle of the second list of the "PAH continuum". Authors R. Luckin *et al.* [19] refer to this principle as the fulcrum or "theoretical stability" of heutagogy, calling it a concept. The notion of PAH continuum was introduced by R. Luckin *et al.* [19]. It refers to the fusion of educational space and the action of "pedagogy-andragogy-heutagogy" within it. In modern society, a person learns constantly, "here and now" and "everywhere". According to heutagogy, the Internet, search engines, massive online open courses, video resources, electronic and learning applications, are currently offering great potential for self-education to mankind. The PAH continuum principle underlines the importance of both classical pedagogy and the andragogic development stage, and the transition to heutagogy in the holistic flow of learning. The PAH demonstrates that the modern lifelong learning paradigm is complemented by "lifelong learning", everyone is in the flow of learning: formal, non-formal, and informal education. And it is informal learning as an individual's self-education that is often compared to the heutagogical approach [20]. The survey showed that 79.2% of respondents said that they do self-development all the time, while 19.46% said they do it partly, and the rest – 1.34% of respondents – had difficulty answering. In response to the coaching question on self-assessment of self-development level on a 10-point scale, the Master's degree students responded as follows: assessed themselves at 3-4 points – 2%, 5-6 points (24%), 7-8 (58%), 9-10 (16%) (Fig. 2).

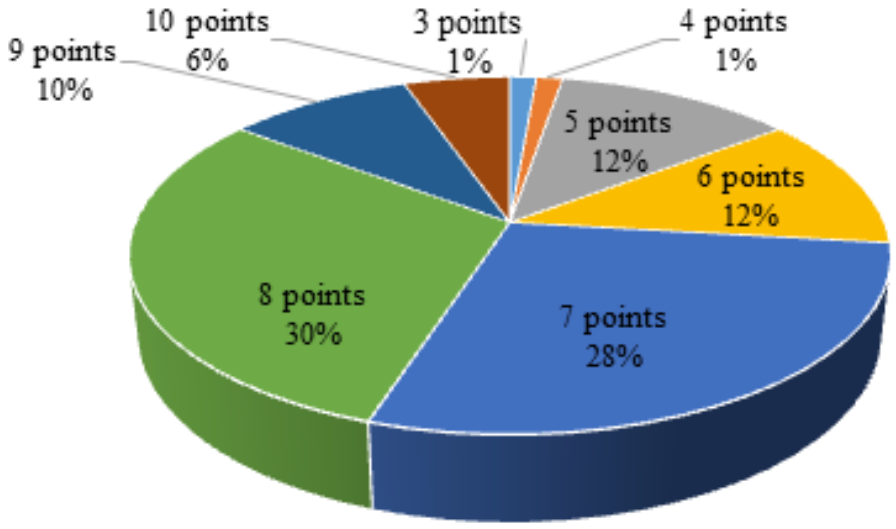


Figure 2. Master's degree students' self-assessment of self-development on a 10-point scale (coaching approach)
Source: developed by the authors

Analysis of the results demonstrates that more than half of the students rate their self-development abilities at 7-8 points. This result is explained, by the fact that students have completed the first cycle of university studies (Bachelor's degree) and, accordingly, have documentary/symbolic confirmation of their achievements (for example, Bachelor's degree diploma), and experience in professional activities. Quite a high percentage of Master's degree students who gave themselves a maximum possible score of 10 points – 6% (or 8 persons). Only 24.8% of students are learning with MOOCs (Mass Open Online Courses) – about a quarter of the respondents indicated that they are engaged in MOOCs. Mostly students indicated such platforms as Coursera [21], Open KazNU [22], Stepik [23], and sometimes Lectorium [24], Schoology [25], Cisco Netacad [26]. This result can be attributed to various reasons. For example, poor awareness of MOOCs, the workload of undergraduate students as most of them have a part-time or extra full-time job, or the disinterest of a certain proportion of students in additional self-study. The answers to the second set of questions in the questionnaire were as follows (Fig. 3). In the questionnaire, the first list of heutagogical principles was used [16], since firstly, they more clearly and distinctively delineate the boundaries and characteristics of the field, and secondly, stylistically, the principles-positions were formulated as complete sentences.

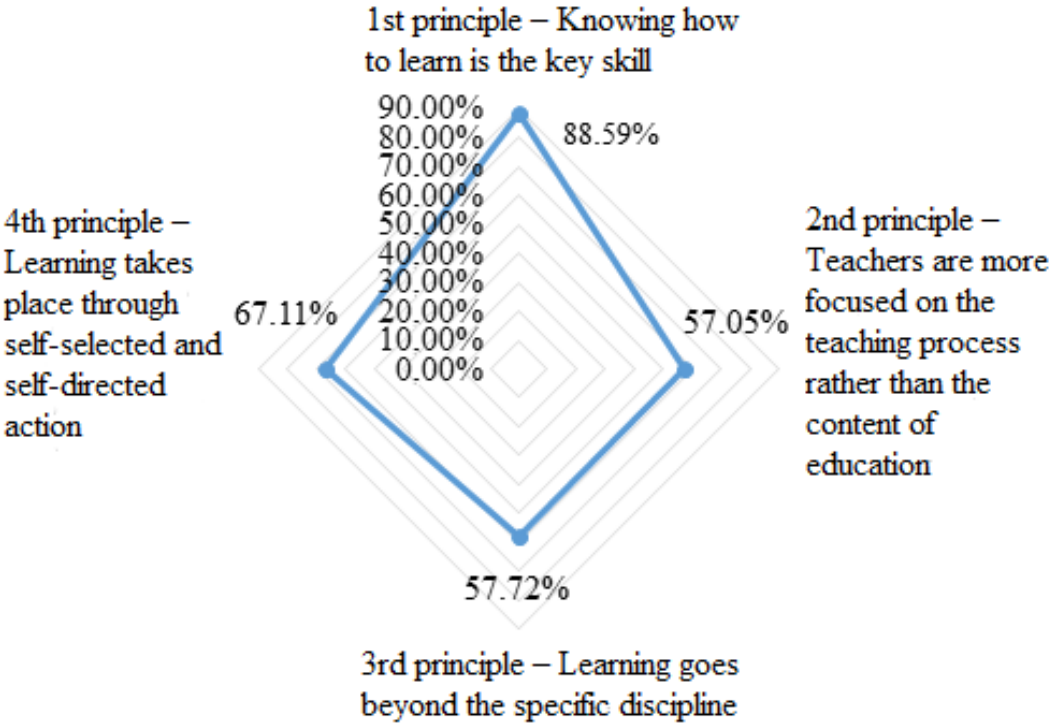


Figure 3. Master's degree students' evaluation of the heutagogical principles – approve of the principles
Source: developed by the authors

The majority of Master's and Doctoral degree students approve of the known principles of heutagogy when others challenge them or suggest improvements. For example, the first principle "Knowing how to learn is the key skill" is supported by 88.59% of students, 7.38% disagree with it, the remaining respondents gave other answers: "I cannot answer unambiguously", "it is too strict", "influences and how to study, what to study for, ways of motivation...", "warm relationship between teacher and student is important". The second principle "Teachers are more focused on the teaching process rather than the content of education" was supported by 57.05% of respondents, 32.88% "did not agree" with this principle. Other variants of answers – 10.07% are "I don't know", "Different teachers may have different attitudes", "Teachers attach equal importance to both what to teach and how to teach", and "It depends on a teacher". That is, this principle aroused greater disapproval than the first principle – a little more than a third of the sample, and a tenth of respondents expressed their opinion. This result shows the desire of almost a third of respondents to follow traditional teaching or the classical paradigm of education, where the teacher is a professional, a source of knowledge and competencies for students.

The third principle "Learning goes beyond the specific discipline" was endorsed by only 57.72% of undergraduates, 38.93% disagreed, and the rest either partially agreed or found it difficult to answer. This principle proved to be the least approved by the students. This situation can be explained by several reasons: firstly, by students' wish to see specialisation, clear contours, and delimitation of subject knowledge-competences in the taught course, the need to form and develop subject-specific or "hard skills", and concentration on them; or secondly, students confuse this principle of self-education with the principle of formal education (classical pedagogy), and are not willing to follow it. Here, as it can be seen, almost half of the students do not agree with this principle. The fourth principle "Learning takes place through self-selected and self-directed action" in heutagogy was agreed by 67.11% and disagreed by 28.19%. The rest of the participants expressed their answers: from optimistic and agreeing – "learning happens all the time, we are always learning (by reading something, talking, watching TV)", "we learn even sometimes without realising it", "In most cases, it is for the best", to sceptical – "sometimes we need direction and perspective", "it depends on circumstances", "What is the teacher for?".

Considering the peculiarities of self-study, one group of Master's degree students (113 people) was asked the question: "What is necessary for successful self-learning?" – 91.2% of undergraduates' students indicated "willpower", 70% indicated self-motivation, 53.4% indicated creativity, 47.2% – openness. In addition, 90.4% of respondents indicated that constant self-learning allows the development of spiritual and moral qualities. Another group was asked about preferences of resources, sources of information for self-study (36 students): paper books were chosen by 36.1% of Master's degree students, e-books by 25%, Internet resources – 22.2%; video resources – 11.1%, and social networks by 5.6%.

Since now is the age of the Internet and knowledge society, due to eutagogical foundations one can obtain and produce new knowledge constantly, including increasing the intellectual potential of a person, and with it the intellectual and social capital of society, country, and the world. Heutagogics develops the phenomenon of the global knowledge economy, the categories of "explicit and implicit knowledge", "knowledge flow" [27], medium and streaming learning, "knowledge diffusion", innovation and creative economy. Far behind the external changes of the digital generation and theories of education, one sees changes in the application of the psychological foundations of student learning: from memory loading to the psychology of thinking development, knowledge and information management. Conventionally, traditional knowledge and skills (the core of classical pedagogical theory) extended by student's competencies (a new category of educational theory since the late 20th early 21st century) are deepened by the category of information (operations with it) and notions of hard and soft skills. Consider the ideas of knowledge management for modern digital didactics.

Knowledge management is a new area of the knowledge economy and is related to education and innovation. As E. Ignatieva [28] notes, "there is a hierarchy of concepts in knowledge management: data, information, knowledge, competence, capacity". For the subject of professional and/or innovative activity it is necessary to comprehend the chain of transition of knowledge: from implicit knowledge → to explicit knowledge (formalisation) → to embodied or product knowledge. The theory of implicit and explicit knowledge is proposed by M. Polanyi [29] and developed by the Nonaka-Takeuchi model. Implicit knowledge is difficult to formalise, hidden in people's heads, it is personalised, and linked to an individual's experience. Explicit knowledge is conventionally codified. The relationship between explicit and implicit knowledge is often represented as an "iceberg" metaphor (Fig. 4), with implicit knowledge under the water and explicit knowledge over the water.

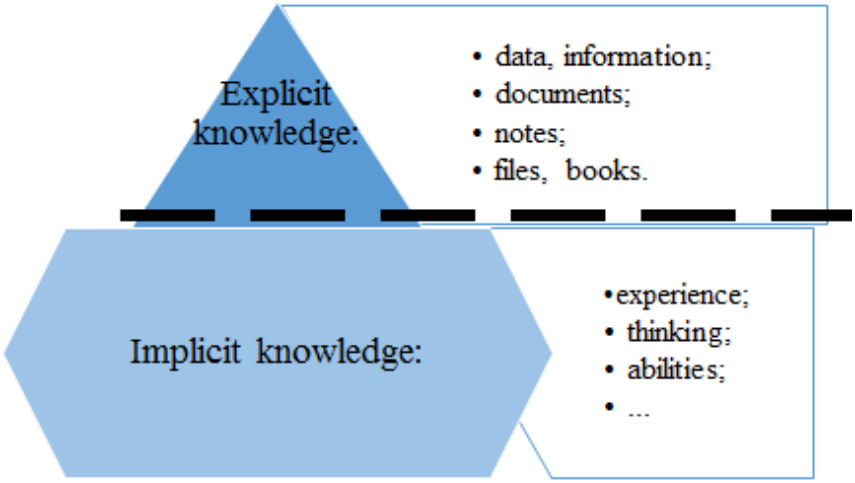


Figure 4. The metaphor of the knowledge "iceberg"
Source: developed by the authors

In terms of economic theories of innovation, knowledge transfer is impossible without "spillovers". L. Spankulova [27] in her monograph "Diffusion of innovations and knowledge flows in the regions of Kazakhstan" describes the genesis of diffusion theories of innovation and knowledge spillovers. "In a broad sense, knowledge spillovers refer to situations in which certain actors can obtain knowledge from external sources for free or at minimal cost" [30]. The main channels of knowledge spillovers are training, science communication, knowledge-intensive and engineering services, technology transfer, etc. Thus, these are external knowledge spillovers, from one actor or agent to another. For example, from a teacher to a student, from one company to another, etc. On the other hand, if to look at it from the perspective of educational theory and science studies, spillovers are also possible between branches of science in general (from one branch of science to another), borrowing ideas that have had a major impact on the development of science, creating knowledge-intensive products and innovation through associative thinking, insight, gestalt. For example, borrowing ideas/models/theories from physics into psychology, economics, and other sciences. It is known that, by analogy with the physical field theory, K. Lewin created the theory of the "psychological field" in Gestalt psychology; C. Darwin's theory of biology served as the impetus for the development of functionalism in sociology, etc. Hence, it is possible to recognise the spillovers of knowledge and ideas between branches of science, and they are related to human cognitive activity.

As for the phenomenon of diffusion of innovation/knowledge from the point of view of psychological and pedagogical science and economic science. On the one hand (psychological and pedagogical science), the diffusion type of thinking is characteristic of the right brain hemisphere (according to B. Oakley [31]) for the emergence of creative ideas, in other words, it is about creative thinking. On the other hand, the concept of diffusionism is actively used in the economics of innovation. The concept of diffusionism has been studied by G. Tarde [32], L. Spankulova, Z. Chulanova, S. Ibraimova [33] considers three stages in the development of diffusionism of innovation. "The economic success, intellectual outpacing dynamism of science, innovation development, and diffusion is inherently diffusionist in nature". E. Alekseeva [34] in her monograph "Diffusion of European innovations in Russia (XVIII – early XX century)" writes: "...The transfer and diffusion of major innovations from one country to another is a working paradigm of modernisation theory...". According to L. Spankulova, Z. Chulanova, S. Ibraimova [33], the diffusion of innovations in close connection with innovation activities is one of the decisive factors in the regional development of Kazakhstan. Interestingly, in the Soviet era, V. Baburin [35] ranked the creative regions (regions implementing the acquired skills) of the former Union of Soviet Socialist Republics (USSR) in the order of importance: Moscow, Kyiv, Minsk, Leningrad, Kharkiv region, Tomsk region, Moscow region, Alma-Ata.

The concept of Education 4.0 has now also emerged [11]. In discussions with educators, there is not yet a consensus on the division between Education 3.0 and Education 4.0, as the new self-education trends are preached by Google (handbook). In classical pedagogy teachers conventionally form a "knowledge matrix" of students, in Education 2.0 knowledge structures of students can be in different configurations (Fig. 5), and in heutagogy the knowledge structure can resemble a "rhizome" (from French "rhizome"). This is a non-linear knowledge structure, with infinite variation, having neither beginning nor end, growing in different directions. In heutagogy, it is virtually impossible to make the structures of knowledge unambiguous for students. Also, summarising the approaches in the succession Table 1 from Education 1.0 to 4.0.

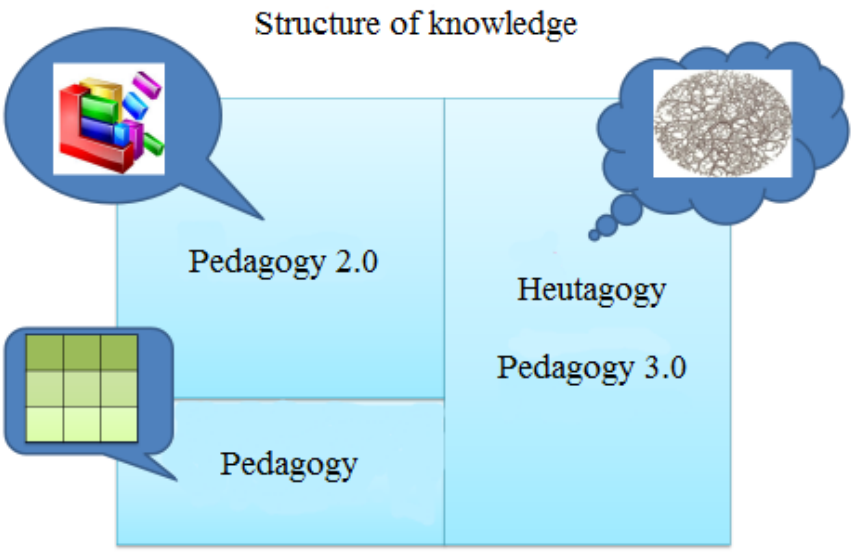


Figure 5. Structures of knowledge in pedagogy and heutagogy
Source: developed by the authors

Table 1. Succession from Education 1.0 to Education 4.0

Comparative characteristics	**Education 1.0**	**Education 2.0**	**Education 3.0**	**Education 4.0**
	Pedagogy (Classical pedagogy)	Andragogy (adult education)	Heutagogy (self-education)	Peeragogy (self-organised self-learning)
Sources of information	Textbooks/texts	Texts, open-source material	Texts, case-studies, second hand experience	Online sources
Learning theory	Didactics of the school	Didactics of higher education	Double loop learning theory	Self-organised self-education
Type of education (conditional)	Formal education	Plus non-formal education	Plus informal education	Lifelong learning + Lifewide leaning
Motivation	Motivation from outside – from teachers, parents, competition...	Intrinsic motivation – increased self-development, recognition and respect	Internal creativity, thirst for learning, interaction with others, self-motivation	Interest in new things, need for innovation, creativity, self-development, professional self-education
Construction of learning process	Linear and consistent	The teaching is non-linear	Self-constructing the learning process	Risomatic learning
Learning focus	Subject-oriented learning through a clear, pre-planned and consistent structure	Problem-based tasks and problem-based learning	Learners' activity based on their experiences, sharing experiences with others, observing the environment, communicating	Information and communication technologies gamification
Monitoring	Educator	Educator/trainee	Trainee	The learner and the team/community
Education resources	Organised by a teacher	Trainee experience with pedagogical support	All resources, self-directed learning trajectory	Information infrastructure Information and communication technologies
Learner autonomy	Dependence on the educator	Learner independence	Learner autonomy	Learner autonomy and partner learning in a community of professionals

Knowledge production	Understanding the subject	Dialogue and interaction, evaluation	Knowledge creation	Information and knowledge management (knowledge creation and dissemination)
Cognitive level	Cognition	Metacognition	Knowledge of cognition (epistemological cognition)	Managing cognitive processes
Level	School	Adult education	Postgraduate training	Lifelong learning
The role of the teacher	Develops the learning process, using material that he/she considers necessary	Facilitator, creates an atmosphere of cooperation, openness, and respect	Shapes the student's ability to: know how to learn, be creative, achieve high performance independently, apply competence in new situations, and interact well with others	
Time	17th to 18th century	twentieth century	Early 21st century	Present time

Source: developed by the authors based on [11; 20; 36, 37]

Table 1 allows identifying the strengths and weaknesses of heutagogics and pyragogy. Hence, the strengths include: firstly, according to the principles of heutagogics, students have the right and opportunity to choose; secondly, students are proactive, themselves responsible for the learning process and results. Heutagogy is successively extended by pyragogy as a theoretical basis for distance learning and self-education. Dual loop learning theory promotes critical thinking skills such as analysis, decision-making, and reflection, metacognition and self-expression [37].

Conclusions

The article summarises the basics of heutagogy as a theory of self-education. The analysis of the results of the survey of Master's degree students on heutagogy principles shows that students, on the one hand, understand the changes taking place and the importance of self-learning and self-education. On the other hand, just over half of the students support the second and third principles, which suggests that it will take time to transform and accept the changes. The Internet system and the digital space have created new opportunities for self-learning and self-development. Understanding heutagogy as a theory of self-determined learning by students and teachers will develop the readiness of a new generation of professionals to work productively in a knowledge economy.

In addition, the weaknesses of heutagogy and pyragogy include: firstly, the difficulties in the process of choosing one's learning trajectory among students. At present, students are more adapted to the traditional education system, and using classical learning strategies; they expect to be shown a direction, a learning trajectory. Further, the students may make the mistake of choosing disciplines, courses, and resources independently. Third, there is a lack of motivation and a lack of consistency in independent e-learning and self-education. Previously, a focus interview was conducted with Bachelor's degree students – future teachers – to assess the PAH continuum, in which they identified risk areas of heutagogy, in particular, dependence on human motivation and willpower, lack of unambiguous systematic knowledge, and others. In the future, there is a plan to develop an MOOC on heutagogy and Education 4.0.

Acknowledgements

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Conflict of Interest

None.

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Вивчення підходів евтагогіки, управління знаннями та ризоматичного навчання на магістерських програмах

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Анотація

Актуальність. Цифрова трансформація освіти зумовила необхідність переходу до геутагогічних принципів у програмах післядипломної освіти. Ще до пандемії теорії про цифрових аборигенів та геутагогіку вказували на нові напрямки в освіті, зумовлені цифровізацією.

Мета. Це дослідження має на меті синтезувати нові парадигми освіти 3.0 та 4.0 у зв'язку з концепціями управління знаннями для підготовки магістрів. Воно також оцінює погляди студентів на принципи освіти 3.0 та самокерованого навчання.

Методологія. Опитувальник, що складається з двох розділів, було запропоновано 149 магістрантам чотирьох університетів Казахстану.

Результати. Розуміння евтагогіки як теорії самокерованого навчання може сприяти вихованню нового покоління професіоналів, готових до економіки знань. Евтагогіка розвиває цей феномен глобалізованого ринку знань. Теоретична частина узагальнює підходи до переосмислення навчання та ідентичності учнів, пов'язуючи цифрові революції з трансформаціями у навчанні та мисленні.

Висновки. У практичній частині досліджуються оцінки магістрантів щодо принципів евтектики. У планах на майбутнє - розробка масових відкритих онлайн-курсів (МВОК) з геутагогіки та Освіти 4.0.

Ключові слова: освіта; дистанційні технології; евтагогіка; цифрові зміни; саморозвиток.