

Analyzing the Role of Heutagogy in Modern Education: A Study on Self-Directed Learning in the Age of Digital Technologies and AI

Rahul Chandore¹, Santosh Sancheti^{2*}, Kainjan Sanghavi³, Mahesh Sanghavi⁴, Dipak Sancheti⁵

^{1,2*5} Department of Mechanical Engineering, SNJB's Late Sau K. B. Jain College of Engineering Chandwad, Dist Nashik, (MS), India

^{3,4} Department of Computer Engineering, SNJB's Late Sau K. B. Jain College of Engineering Chandwad, Dist Nashik (MS), India

¹rahulchandore99@gmail.com, ^{2*}santusancheti@gmail.com, ³kainjan@gmail.com, ⁴sanghavi.mahesh@gmail.com,

⁵deeps.sancheti@gmail.com

How to cite this article: Rahul Chandore, Santosh Sancheti, Kainjan Sanghavi, Mahesh Sanghavi, Dipak Sancheti (2024) Analyzing the Role of Heutagogy in Modern Education: A Study on Self-Directed Learning in the Age of Digital Technologies and AI. *Library Progress International*, 44(3), 16504-16515

Abstract:

In the rapidly evolving landscape of education, heutagogy—self-determined learning—emerges as a vital approach, enabling learners to navigate the demands of the digital age and artificial intelligence-driven environments. This study explores the role of heutagogy in fostering autonomy, flexibility, and critical thinking in learners. By examining the intersection of digital technologies and self-directed learning, the paper highlights the importance of moving beyond traditional pedagogical and andragogical frameworks to cultivate lifelong learning skills. Integrating AI, robotics, and IoT in education necessitates a shift towards learning models that empower learners to adapt to continuous technological change. The paper provides an in-depth review of theoretical concepts, practical case studies, and successful implementations of heutagogical practices, aiming to demonstrate how these approaches can prepare individuals for the future workforce. The study concludes by emphasizing the need for educational institutions to embrace technology-driven, learner-centered models that support self-directed learning and personal growth.

Keywords: Heutagogy, self-directed learning (SDL), digital technologies, artificial intelligence, lifelong learning, learner autonomy

1. Introduction

Education in the digital age has become an essential research subject in recent years. This change of interest is a response to the progress of a relatively young research framework called educational psychology, which has shifted the focus from explaining educational effectiveness to making pedagogical practices more effective. It is also a reaction to rapid technological development in every field in the 21st century, which has characterized the structure of the current world through continual and widespread change. These changes have put education under pressure to prepare learners for the society they live in and the future (Ettyani et al., 2023). There is a case for abandoning the traditional instructional approach, which does not prompt the acquisition of flexibility or resilience in learners and perhaps even renders them less capable of such growth. This necessity opens the way for the evolution of a self-directed learning framework to answer these future challenges. The nature of educational practices has changed. We need to address a pertinent question: if the tools we use in education are evolving, then shouldn't the ideology and philosophy behind education and learning also need to evolve? This question brings us to the dilemma of traditional education's relevance and philosophical state amidst these changes (Blaschke, 2021). Traditional education can no longer cater to the needs of our society for many reasons. In the age of technology, the world is moving at its fastest pace ever. Our culture constantly evolves with new demands (Glassner & Back, 2020). The education system has not been able to keep up; the same education that used to serve the needs of previous generations cannot meet the demands of the new age.

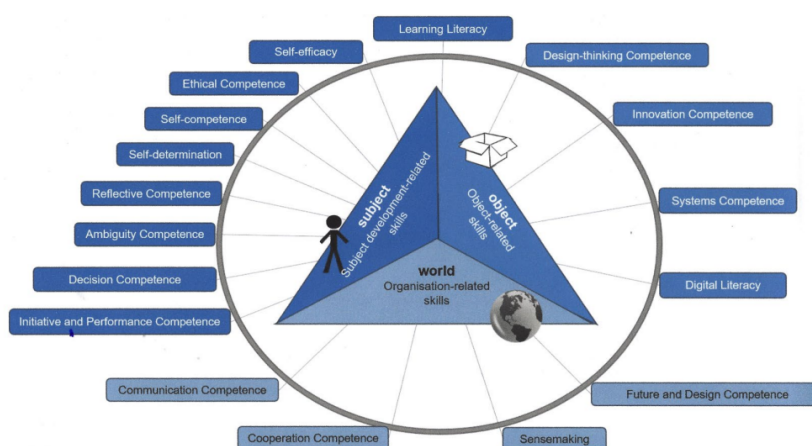


FIGURE 1:Future skills framework (Ehlers & Kellermann, 2019)

Suppose AI, robotics, IoT, and the propagation of manufactured intelligence dominate the workforce. Why are we teaching our children using an old model, and how prepared are they to work with these robots and machines? Heutagogy can potentially prepare future generations to face these modern challenges, merge with technology, and realign it with human psychology and behavior.(POGHOSYAN et al.2024)(Perchard, 2022)

1.1 1.1. Background and Rationale

Two primary methodologies can help distinguish trends in educational psychology: pedagogy and andragogy. While pedagogy focuses on the training and education of children, heutagogical practices are designed for adults' lifelong interest and continued personal growth. The term itself originates from the Greek meaning self-directed learning. In both of these definitions, autonomy is inherent to an individual, and it is up to the individual, parents, and governments to determine the degree of control they allow. Progression has been ongoing for over fifty years. For an extended period, interest has shifted away from both andragogy and pedagogy, and more recently towards the initial development of heutagogy. This interest is driven by a growing recognition of our capacity to learn as a necessity in a global digital age (Conesa et al., 2020)(Bucura, 2020)

Indeed, greater access to digital technologies and the internet has created a globalized world with few boundaries, particularly regarding information provision. Current educational emphasis has been, by and large, on being more student- or learner-focused. Learning, education, and biology are based on the premise of natural design in that people fundamentally want to learn. Curiosity from within and the Finnish model of schooling lead to the exploration of people's capability to access learning and, indeed, self-directedness (Blaschke and Hase 2021). From the above, there has been a shift in relating individual needs and autonomy about learning and providing learning experiences to the support of the self-directed. The learning society and learning organization have become a current interest for industrialized states as the information age is redefining who can access information, thus having the opportunity to be the most informed and productive. Several universities have been developed on this model in the United Kingdom. The world has produced lifelong learning, which is evident in the Virtual Learning Environment (Imamov & Semenikhina, 2021). In the Department of Educational Psychology, information about the development of the above stages made it possible to develop heutagogy as a natural and holistic model of human learning. To be self-directed enables the ability to learn and adapt (Ciarli et al., 2021). Several underpinning theories and ways of thinking are drawn upon in heutagogical practice. Heutagogy is based on two perspectives of human learning: experiential knowledge and transformation. (Volberda et al.2021)(Haleem et al.2022)

2. 2. Understanding Heutagogy

Heutagogy (self-determined learning) stems from the Greek terms for "self" and "to guide," focusing on an individual's desire to understand. Heutagogy describes an exponentially growing domain of interest in the educational landscape (Moore, 2020). Heutagogy is an educational approach that ultimately supports the development of fully autonomous learners, effectively promoting the development of individuals who learn how to learn. Heutagogy emphasizes the concepts of autonomy and capacity for metacognition, non-dyadic interaction with knowledgeable others, and the habitus that harnesses self-awareness or reflexivity. It is not a new concept; it is an option of andragogy. The central focus is learning, especially emphasizing learning character and capability (Blaschke, 2021).

The theory of heutagogy was constructed based primarily on the andragogical theories and practice. It is what andragogy

evolves into when education takes place within content that makes autodidacticism necessary. There are inherent implications to technology and education that have popularized recent exploration into the concept of heutagogy. Heutagogy can replace or work with traditional pedagogical approaches and is helpful for doctoral supervision and life-wide and lifelong adult learning. In a world characterized by information overload and rapidly changing occupations, self-directed learners will be more successful because they take charge of identifying the learning they need to be able to practice in the digital age. They will be more flexible and not rely on a single model of good practice. Many theories can form a solid base for the creation of new economic characters and faculties (Stoten, 2020).

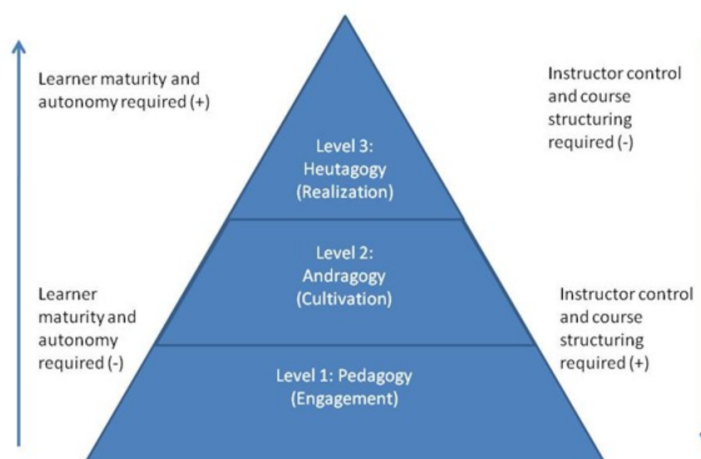


Figure 2. Progression from pedagogy to andragogy then to heutagogy (Blaschke, 2021).

2.1 2.1. Definition and Principles

The term 'heutagogy' is a compound of the Greek words 'heauton' (meaning 'self') and 'agogos' (meaning 'leading'; 'someone who leads'). Heutagogy, therefore, is 'learning to learn' and is characterized by a few fundamental principles:

1. The capacity to be a self-determined learner;
2. The capacity to be a self-directed learner, with a focus on setting one's own learning goals and structuring tasks, strategies, and evaluation;
3. Becoming intrinsically motivated in one's approach to learning and
4. Enjoying significantly increased self-esteem.

Heutagogy can be considered unique from related fields and conceptually underpinned by humanistic psychology and biological-based constructivism. While often confused or compared with pedagogy and/or andragogy, these learning sciences are distinct, fueling the misunderstanding that in educational institutions, students are led or facilitated under the assumed leadership of adults in positions of pedagogical and/or andragogical authority (Kusdiyanti et al.2024). Heutagogy is supported by digital technologies and other recent and emerging technologies, such as robotics or technologies that support e-humanities. Indeed, it is supported with appropriate consideration of technologies and society, embedded in suitable and employable methods that embrace the developed curriculum. Drawing on literature, the assumptions of the heutagogical landscape also imply a re-establishment of the social, economic, and applied context, which, when developing professionally, assists in the form of practicality and discussion in the form of greater relevance, appeal, and to some extent, the definitive nature of the problem-solving, projects, assignments, additional methods, and technologies employed, not to mention the collaborative operation, involvement, and activity of the student in order to utilize them. It is assumed in literature that in some areas of work, this knowledge to which the activity is tied is subject to radical change. Change is a driver or instead drives the need for this reform, simply delivering many fundamental and practical variables, such as the willingness and capacity of the individual to make the change within the context where work and employment need to be ever more dynamic. This practice's relevance with reality impels satisfaction. This extends to self-learning and applies to further psychosocial and conventional involvement beyond formal study. This can only be easily and universally facilitated, but a context can be created to assist self-directed learners with these personal demands.(Vinayan and Harikirishanan 2021). The following table outlines how heutagogy principles translate into essential lifelong learning skills that empower individuals to thrive in dynamic and unpredictable environments. Each principle fosters specific capabilities, from learner agency to reflective thinking, essential in cultivating self-directed learners.

Table 1: Key principles of heutagogy and the corresponding lifelong learning skills

Heutagogy principle	Lifelong learning skills
Learner agency	Active learning and learning strategies; autonomy; creativity; flexibility; leadership; personal agility; self-direction; self-initiative (intrinsic motivation); self-management; self-regulation
Self-efficacy and capability	Self-efficacy; tolerance for ambiguity
Reflection and meta-cognition	Ability to reflect; analytical thinking and innovation; complex problem-solving; critical thinking and analysis; ideation; reasoning; self-regulation; sense-making
Nonlinear learning	Active learning and learning strategies; collaboration; cooperation and communication competence; digital literacy, technology use

3. 3. Self-Directed Learning in Education

A focal point of educational discourse since at least the 1970s, self-directed learning (SDL) encompasses various learning processes in which learners exert considerable control and influence. Whether considered an educational approach, an instructional technique, or a theory of growth and maturation, self-direction has the learner as an active force rather than a passive member of the educational process. The "self" in self-directed learning refers to learner agency and personal responsibility, such that learners take primary responsibility for the planning and implementing of their own learning experiences (Ahammad2023). This emphasis on autonomy and control of learning distinguishes SDL from teacher-centered and more traditional pedagogical approaches. Despite this emphasis on individual learning, several SDL models, theories, and strategies published over the past five decades have focused on best facilitating the SDL process. Many propose frameworks that outline how learners can be facilitated and stimulated to gain the competencies they need to exhibit SDL readiness. In other words, educators can help foster SDL by creating learning environments in which learners are encouraged to develop independence in their learning. The positive results of such initiatives have been linked with the maturation of lifelong learning attitudes and the development of critical thinking, problem-solving, and study skills necessary for engagement in learning. SDL approaches are compatible with theoretical perspectives on learning that underscore the importance of mental processing, relating and breaking down newly encountered information, self-evaluative mechanisms of belief revision, and transformational learning. Within the pedagogical literature, SDL is often depicted as a desirable goal of education rather than as a problematic element of everyday teaching practice.

Nevertheless, educators and learners encounter various challenges when trying to understand and adopt an SDL approach. Some learners need to prepare, while others are unaccustomed to this approach or feel that it is not the responsibility of teachers to provide support for cognitive development. Individual motivations and perceived relevance of the material to their personal and professional interests are also assumed to be necessary, such that learners' goals, intentions, and interests must be considered when investigating facilitation and support. Some approaches to SDL in education are seen as a form of rebellion and a reaction to traditional teaching measures, including disadvantaged, wider-reaching, or newer populations that we need to engage in education. These reactions point to the potential role of SDL to disrupt habitual behavior and unsettle traditional forms of pedagogy in educational settings. Heutagogy is a theory of learning that encapsulates education's shift towards holistic, competency-based, and lifelong learning. The heutagogical process is one in which learners are both capable and responsible enough to work out their goals in life, given their starting conditions, and use them to guide their efforts for what they will become in their future positions of participation in society (Tougas2024). Although the assessment processes may differ from non-heutagogic models, the learning motivation and process focus are similar, placing responsibility and self-regulated learning with each actor. Heutagogy is not a delivery model; instead, it shapes the focus of learning away from the institution and onto the individual and into eventual workplace behavior. Given

the shift in modern education towards a lifelong learning approach, SDL is essential to ensure learners are equipped for the rapid change and approaching automation of all but the desktop and professional job markets (Tougas2024).

3.1 3.1. Concepts and Theories

3.1. Concepts and Theories. Many theories and models have been discussed in conceptualizing self-directed learning (SDL), such as humanist pedagogy, experiential learning cycle, personal learning environment (PLEs), social professions, connectivism, and effortless learning, culturally responsive pedagogies, transformative leadership, large-scale transformative learning, and discourses within political philosophy and leadership theory.

One foundational model of adult learning is the adaptation of educational philosophies, also known as andragogy. Andragogy is a model of adult learning that describes the role of learners in their learning process. According to the theory, a self-directed learner can actively and independently decide that they are prepared to learn, and they would do it better if they proceeded with learning without the intervention of an external instructor (Abeyrathne & Ekanayake, 2020). There needs to be a direct reference to online education in this adult learning theory. Regarding online learning as asynchronous learning, it elucidates online learning as the replacement of traditional forms of pedagogical processes for the dissemination of information and the replication of assessments. Thus, self-directed learning is part of pedagogical considerations, and learners need an understanding of the methods of active learning to take the opportunity to distance themselves from learning.

Intrinsic motivation is essential for deep and generative learning. More flexible self-regulation in motivation is reported as a characteristic of successful student self-regulation. SDL implies that higher education (HE) students take the initiative to identify their learning needs, develop action plans with self-assessment, undertake the learning, and evaluate the learning outcome. However, what needs to be clarified in the framework is how the presence of these systems and self-regulation paradigms can ensure the ability of university teachers to establish deep and meaningful intrinsic motivation and continuance. With advances in AI and digital technologies, there are ongoing challenges facing educators who are trying to transfer from current pedagogical systems to andragogy in traditional, online, hybrid, and flex model curricula. Over-reliance on traditional methods using the current SDL plan model has proved dysfunctional. The unique requirements of SDL are immediate and compelling. There are opponents to exposing students as adult learners ahead of time and not in any way looking forward to the resistance needed to challenge the faculty. Policies must be ignored in this regard. (Laine et al., 2021). Nevertheless, numerous examples testify to the opposite. Cases of curricular adherence to evidence-based practice and policy, offering cases of SDL models to provide guidance and counselors with standard support, have generated excellent results.

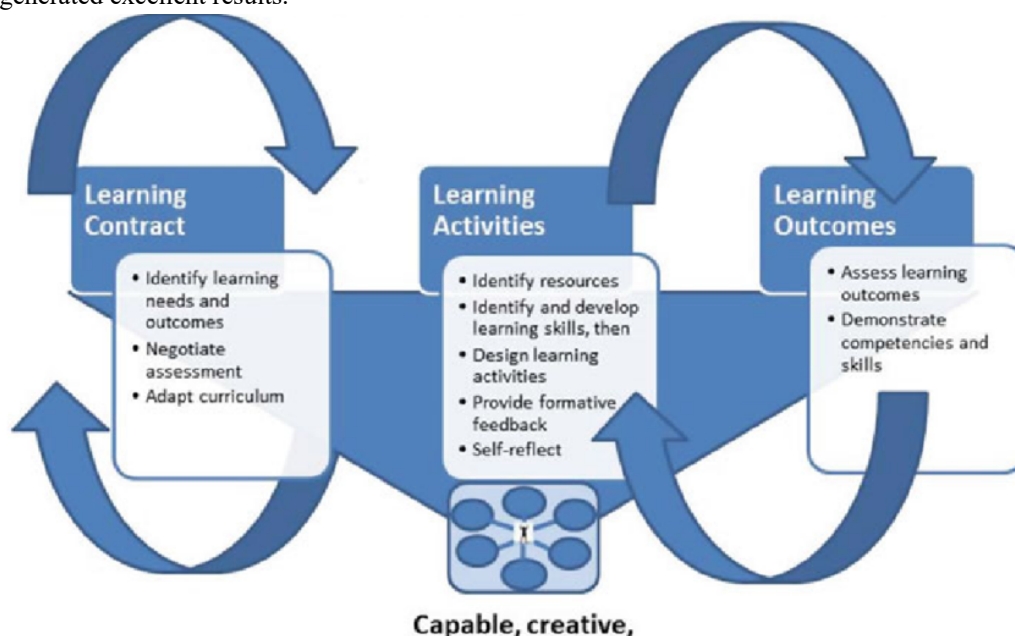


Figure 3: The heutagogy design process (Blaschke and Hase 2021)

4. 4. Integration of Digital Technologies in Education

In the last couple of decades, technology has provided innovative tools that lead to several new ways of using it in education. By implementing digital technologies, educational systems worldwide aim to transfer the knowledge-based academic educational system to skill-based education (Ferri et al., 2020). In other words, technology can change the

educational system's relationship between students and teachers. Various digital technologies, including online learning environments, learning management systems, and educational apps, have shown an explicit promise to contribute to fruitful and productive innovative practices in the educational system by providing a new learning experience based on advanced technologies, such as sending feedback to students directly or grading students' assignments based on artificial intelligence, projecting students' presentations, and engaging students in activities with modern collaborative tools (Khan & Thomas, 2022).

One of the main advantages of digital learning might be making education a public service, which breaks down many traditional obstacles to education, such as money, time, and location. Additionally, digital learning presents a new chance to communicate and meet new friends from different ethnic origins, religions, and cultures. Furthermore, digital learning could provide an environment more suitable for delivering accessible learning for groups of people living in remote areas who cannot give up their work to pursue an offline education. Moreover, digital learning could offer new patterns for the educational system, such as lifelong educational patterns and practical systems applicable to the working population, which gives further privilege to individualizing the learning experience. In conclusion, educational academies and research centers should engage digital learning with society by making a series of efforts to encourage teaching, organizing operational guides and online assessment services, increasing the international degree of curricula, and ensuring the validity of certificates and degrees to guarantee the compatibility and integration of the educational system within a digital society and their future requirements.

4.1 4.1. Advantages and Challenges

Over the last two decades, digital technologies have become an integral part of everyday life and a wide range of professional activities in the 21st century. One of the most significant benefits of digital technologies in education is the increased access to vast resources, including many digital textbooks, journals, blogs, webcasts, and e-libraries (Liesa-Orús et al.2020). Besides access to diverse resources, digital technology feels more attractive to children and learners, who become more engaged in educational activities. Furthermore, digital technologies have the potential to offer highly personalized educational opportunities and provide a pool of formative assessment data that can help drive significant school- and student-level improvement. Using social networking services, technology can promote an environment that motivates students to engage in more collaborative learning, reflect multiple perspectives on a given topic or situation, and leverage the power of the team to solve problems (Qureshi et al., 2021). Educational programs that connect students around the world have massive potential for developing intercultural understandings and global awareness in new generations of students (Drake & Reid, 2020)

Despite these benefits, there is a widely acknowledged "digital divide," which refers to unequal access to digital technologies among subgroups of the population-based strictly on social factors and economic conditions (Song et al.2020). In addition, integrating digital technologies in teaching and learning brings many challenges, including the fact that some educators still do not value technology or believe that teachers do not need to use digital technologies to improve students' learning. Furthermore, in some school districts with funding and resource disparities, technology becomes the first to be canceled. In many countries, educators are still frustrated by the perceived "primacy of technology" and sacrifice a more well-rounded education, as technology is seen as valuable in its own right (Song et al.2020). Even when teachers want to integrate digital technology in teaching and learning situations, they may not be able to do their best, design creative and innovative learning tasks using digital technology, and develop a positive learning environment due to various factors, including lack of time, lack of motivation in students, lack of knowledge about digital technology, or sometimes resistance from school leaders or system administrative management about the use of digital technology (Song et al.2020). If appropriate professional development for the practical usage of technology is not considered, students may not develop an adequate level of digital literacy.

Consequently, educational stakeholders have undertaken many policy initiatives to successfully prepare teachers to integrate digital technologies. This is because information retrieval from the Internet can be time-consuming, leading to "information overload"—a state in which learners cannot filter, integrate, and transform information toward their goals. Furthermore, digital technologies result in the rise of information abundance that complicates teaching and learning without appropriate digital literacy. Given both the advantages and challenges, educational leadership needs strategic planning for using digital technology in education (Dimitriadou & Lanitis, 2023). Besides, educators need proper professional development on the practical usage of digital technology in the educational context. Despite such a massive research gap, some research needs are provided at the end of this review.

5. 5. The Impact of AI on Education

Artificial intelligence (AI) technologies have influenced education and interpreted rather large amounts of data through

sophisticated techniques. AI is used in schools to support instructional technology and graphical grading systems. In addition, machine learning algorithms in the education sphere may also assist primarily in identifying student learning aptitudes and profiles, allowing models to be tailored to the student's experience based on their present cognitive and aptitude levels. Therefore, because learners can acquire the abilities they require quicker in a more personalized, functional, and easily understandable manner, educators can take a great chance to use AI for complicated instructional approaches and real-life learning experiences. This research will concentrate on the impact of using AI to provide intelligent applications for adaptive instructional strategies that could lead to an enhanced learning experience for learners. Adaptive instruction can support students in setting up bilingual resources based on their strengths and concerns. AI should not just deliver lectures but also provide learning opportunities based on conversation analysis of each student's interactions (Moore, 2020). AI can shape learning according to the complex interaction of the learner's capabilities, motivation, and perceptions in the learning experience.

AI in education will support students' better learning by creating insightful AI, which will make them autonomous and deliver real-time feedback directly outside of the classroom. One of the most influential ways AI will affect future educational outcomes might be through assessment (Celik, 2023). This will switch the academic system from centering on competencies that educators think are important for achievement and being prepared for adulthood, careers, etc., to working in classrooms that are currently being taught. However, educational stakeholders should be aware of the enormous potential and limitations of both the algorithm and the datasets used. There are two primary facets of the problem: a good dataset. However, deficits within the algorithm might lead to labels for pre-appraisal of students influenced rapidly by historical systemic biases. There are promising forecasts for AI in the modern-day scholarly structure. The optimistic potential is significant and memorable, and it is spoken about far more broadly than the destructive aura by several scientists involved.

5.1 5.1. Applications and Future Trends

AI has the potential to revolutionize traditional educational practices by creating adaptive and personalized learning experiences that mirror the needs and learning pace of each student. A primary goal of using AI in education is to extend access to learning opportunities by offering individualized, on-demand support that is impossible in traditional small-scale pedagogical settings (Alam, 2023). Many tools and technologies are in use today that leverage AI or data-driven models of one kind or another. Intelligent tutoring systems, chatbots that support learning, and predictive analytics for student success are three well-established tools that offer cost-efficient means to improve pedagogical efficacy, student persistence, and estimated return on investment (Bates et al., 2020).

Looking to future trends, a new vanguard of technologies is poised to profit from recent AI advances. The convergence of artificial intelligence, cognitive, and affective models with both augmented and virtual reality enables the potential for even more immersive, personalized, and engaging learning experiences. Educators will no longer need to guess about learner experiences, having rich movements and interactions with data on which to base decisions. In the hands of content creators, AI will drive profound curricular decisions while guiding the moment (Hofer et al., 2021). For now, doing so in a way that meets the needs of the typical human teacher will remain technically and practically challenging. Long-standing social and ethical questions around the role and purpose of a good education then color these technological discussions (Servant-Miklos & Noordegraaf-Eelens, 2021).

Forecasts anticipate increasing adoption, but educators' resistance to some forms and uses of AI illustrates critical areas of overlap and concern. Indeed, the insufficiency of AI's capacity to replace skilled human instruction may stand as a sunk cost in our new AI-enabled learning economy as educators and professionals attempt to resist changing pedagogical practices to align with the affordances of AI technologies. Educators must be vigilant and ready to critically assess policy and software and the effects of each on human learning and learners. The results of analyzing publications, funding, and patents in AI education innovation suggest that AI and education convergence stimulate equal parts optimism and anxiety. We view AI's possible future role in educating humans as contingent. This suggests areas where technology can be deployed in more radical and speculative ways. AI can provide increased access to custom educational opportunities. However, when educators shift roles or entire institutions to align with AI-driven affordances, ethical and practical questions of purpose, pedagogy, assessment, equity, and deeply entrenched academic practices resurface. Importantly, decision-makers need not assume that any ready-made solution can be found by turning to AI alone. Policy work might draw AI's productive flicker out of resistance, forcing clear articulation of this contested space and into resilience, asking educators at all levels how AI can contribute to better education. With a more critical frame, it becomes possible to consider potential ethical and human rights costs and benefits and engage practitioners to plan and deploy AI productively where pedagogy is central. Different modes of technology assessment will bring out competing technical and ethical features of new applications (Chan, 2023).

6. Case Studies and Best Practices

In researching the role of heutagogy in the modern learning environment, it is critical to bridge the gap between theoretical discussions of the concept and the practical realities of its implementation. This paper seeks to do so by collecting a series of case studies and best practices that provide helpful examples of how heutagogy can be effectively implemented in the modern world, which is saturated with digital technologies and AI.

Table 2: Case Studies on the Implementation of Heutagogy with AI-Enhanced Learning Across Different Sectors

Case Study	Institution/ Company	Context	Implementation	Outcomes	Challenges
Integrating Heutagogy in Higher Education with AI-Enhanced Learning	A leading university in the UK (Fitria, 2021)	University adopted heutagogy for master's level programs using AI-driven learning platforms.	AI-driven platforms provided personalized learning paths with faculty acting as mentors.	Improved engagement, self-regulation, and preparedness for the job market.	Resistance to autonomy and need for support in self-regulation.
Digital Heutagogy in Remote Learning during the COVID-19 Pandemic	A vocational training institute in India (Putra et al., 2023).	The institute shifted to remote learning due to the COVID-19 pandemic, empowering students with self-directed learning.	Students used digital platforms to manage their learning independently, with faculty providing feedback.	Critical thinking skills improved, and dropout rates decreased despite remote learning challenges.	Limited internet access and initial struggle for faculty adapting to new roles.
Implementing Heutagogy in Corporate Training for Lifelong Learning	A global IT corporation Blaschke L.M. (2012)	The corporation introduced heutagogy in employee training programs to promote continuous learning and adaptability.	Employees used AI-driven learning platforms to select relevant topics with flexible learning paths.	Increased innovation, self-efficacy, and employee retention in the company.	Some employees felt overwhelmed by self-directed learning, requiring additional digital literacy support.

Each case study illustrates a custom approach to self-directed learning in various educational spaces, such as formal learning environments, educational resources and tools, and informal learning environments. The factors that contributed to the success of these case studies include stakeholder engagement and support, customizing the education approach based on the learners' needs, providing frequent interactions and feedback, and the assistance of knowledgeable staff. Best practices are emerging from these case studies that can assist the educator or instructor who wants to implement an environment of heutagogy, regardless of the learning environment.

There are examples of various implementations in educational settings that can illustrate the principles of heutagogy. Those examples cover various learner populations and different curricular topics ranging from short to semester-long courses. The implementations in these examples have shown that it is possible for learners to develop a high level of independence in their learning and that current digital technologies and AI can guide and ease this process for the learners throughout their higher education experience (Guan, Mou, & Jiang, 2020). Both initiatives included an initial workshop in which learners were introduced to the concept of heutagogy, the opportunities and risks of digital technologies, and the principles of the three-stage learning model in which these technologies were used. However, all learners in our studies took part voluntarily and were supported by the didactic team in case of queries. Furthermore, the applications used a learning analytics dashboard that allowed the didactic teams to monitor the learners in case of disorientation or other issues, which contacted the affected learners and showed the possibilities to resolve the issue at hand.

7. 7. Conclusion and Future Directions

The findings presented in this study show that heutagogy in the form of self-directed learning is valuable in any learning environment. The rapid development of technologies and the increasingly frequent use of artificial intelligence only reinforces the need for all forms of education to support genuine self-direction. The increasing complexity and rapidity of changes are unlikely to allow us to develop a detailed script for learning that would facilitate the student's professional career in the future or solve other potential problems. This is why an orientation on self-directed learning competencies is essential. Current education policies should assist in this change, which may also require redefinition.

The findings have several implications for educators and educational policymakers. First, the development of technology

has shown that learning is no longer what it was in the past. This has opened a debate on the most appropriate approach to supporting learning in the present world of rapidly changing technologies and is one that many are still engaged in. We can reach the optimal solution with further research development and in-depth discussions with teachers, technologists, and, most importantly, the learners. Second, this study identifies a clear potential value in extending the philosophy of heutagogy and self-directed learning to all educational levels, developing and facilitating its use with any learner of any age. Right now, we have outlined how best to maximize this transformative potential. A fusion of such a philosophy of learning and enabling technologies could be used to influence and shape future education. We advocate the ski-slope argument here; by being adaptable—or ahead of the game—we may influence and lead the changes that are coming in the eyes of the educational reading public. Evolution and revolution in education will always continue, and the landscape of research, learning, and teaching will continue to develop in organisms such as technologies.

7.1 7.1.1. Key Findings and Recommendations

7.1.1.1. Key Findings This research has demonstrated the significance of learner autonomy in the modern world.

As societies move away from traditional industrial models, learners need increasing skills and capabilities to navigate their learning pathways. Our research provides valuable guidance for implementing such a learning approach. Recommendations Based on the process undertaken and insights from the dataset, we can make the following recommendations:

1. Pioneering educators should start to create contexts for heutagogy and self-directed learning by melding technology with human processes and communicating with others about any steps taken, findings, and outcomes.
2. Leaders and educators in educational institutions should be more proactive in melding digital technologies with practices that facilitate and support the growth of self-directed learning inside the classroom or learning context.
3. Link with other researchers to conduct more research on the points arising from this research, particularly on heutagogical theory and practices.
4. Look for ways to facilitate training for educators and leaders in professional learning programs about existing and emerging strategies to accomplish these goals and support and evaluate their continuing professional development.
5. Encourage discussions and positive actions in forums such as schools, communities of practice, research forums, and board meetings about the need to create beneficial workplaces and societies for people by developing students who can continue change and innovative cycles throughout their lifetime. Complement such actions with advice on what to say and how to create urgency about self-directed learning to establish learner autonomy as a genuine necessity in schools.

7.1.2. Recommendation Summary

The ultimate reason for learner autonomy is to transform educational systems to perpetuate more humanity and innovation. It is critical to continue working together to dialogue about and create future practices for lifelong learning spaces for society and for each individual who learns. It is essential to start taking genuine, small steps inside each learning organization that express the need for the unique mix of what humans can do uniquely and technology to establish heutagogy and learner autonomy in this day and age.

References:

- Abeyrathne, D. K., & Ekanayake, S. Y. (2020). Self-Directed Learning (SDL) In Higher Education: Practices and Issues. *Asian Journal of Electrical Sciences*, 9(2), 40-49. <https://doi.org/10.51983/ajes-2020.9.2.2555>
- Ahammad, F. (2023). SELF-DIRECTED LEARNING: A CORE CONCEPT IN ADULT EDUCATION. *The Online Journal of Distance Education and e-Learning*, 11(3).
- Alam, A. (2023). Harnessing the Power of AI to Create Intelligent Tutoring Systems for Enhanced Classroom Experience and Improved Learning Outcomes. In *Intelligent Communication Technologies and Virtual Mobile Networks* (pp. 571-591). Singapore: Springer Nature Singapore. https://doi.org/10.1007/978-981-99-1767-9_42
- Bates, T., Cobo, C., Mariño, O., & Wheeler, S. (2020). Can artificial intelligence transform higher education?. *International Journal of Educational Technology in Higher Education*, 17, 1-12. <https://doi.org/10.1186/s41239-020-00218-x>
- Blaschke, L. M. (2012). Heutagogy and lifelong learning: A review of heutagogical practice and self-determined learning. *International Review of Research in Open and Distance Learning*, 13(1), 56-71. <https://doi.org/10.19173/irrodl.v13i1.1076>

Blaschke, L. M. (2021). The dynamic mix of heutagogy and technology: Preparing learners for lifelong learning. *British Journal of Educational Technology*. <https://doi.org/10.1111/bjet.13105>

Blaschke, L. M., & Hase, S. (2021). So, you want to do heutagogy: Principles and practice. *Unleashing the power of learner agency*. EdTech Books, 21-40.

Bucura, E. (2020). Becoming self-directed and self-determined: Learning music pedagogically, andragogically, and heutagogically. *Problems in Music Pedagogy*.

Celik, I. (2023). Towards Intelligent-TPACK: An empirical study on teachers' professional knowledge to ethically integrate artificial intelligence (AI)-based tools into education. *Computers in Human Behavior*. <https://doi.org/10.1016/j.chb.2022.107468>

Chan, C. K. Y. (2023). A comprehensive AI policy education framework for university teaching and learning. *International journal of educational technology in higher education*, 20(1), 38. <https://doi.org/10.1186/s41239-023-00408-3>

Ciarli, T., Kenney, M., Massini, S., & Piscitello, L. (2021). Digital technologies, innovation, and skills: Emerging trajectories and challenges. *Research Policy*.

Conesa, J., Batalla-Busquets, J. M., Bañeres, D., Carrion, C., Conejero-Arto, I., del Carmen Cruz Gil, M., ... & Mor, E. (2020). Towards an educational model for lifelong learning. In *Advances on P2P, Parallel, Grid, Cloud and Internet Computing: Proceedings of the 14th International Conference on P2P, Parallel, Grid, Cloud and Internet Computing (3PGCIC-2019)* 14 (pp. 537-546). Springer International Publishing.

Dimitriadou, E. & Lanitis, A. (2023). A critical evaluation, challenges, and future perspectives of using artificial intelligence and emerging technologies in smart classrooms. *Smart Learning Environments*. <https://doi.org/10.1186/s40561-023-00231-3>

Drake, S. M. & Reid, J. L. (2020). 21st century competencies in light of the history of integrated curriculum. *Frontiers in Education*. Volume 5 <https://doi.org/10.3389/educ.2020.00122>

Ehlers, U.-D., & Kellermann, S. A. (2019). *Future skills – The future of learning and higher education: Results of the international future skills Delphi survey*. Karlsruhe.

Ettyani, E., Fadilah, E., & Sabat, Y. (2023). HEUTAGOGY AS A TRAINING APPROACH FOR TEACHERS IN THE ERA OF SOCIETY 5.0. *Magister Scientiae*. <https://doi.org/10.33508/mgs.v5i12.5030>

Ferri, F., Grifoni, P., & Guzzo, T. (2020). Online learning and emergency remote teaching: Opportunities and challenges in emergency situations. *Societies*. <https://doi.org/10.3390/soc10040086>

Fitria, T. N. (2021, December). Artificial intelligence (AI) in education: Using AI tools for teaching and learning process. In *Prosiding Seminar Nasional & Call for Paper STIE AAS* (Vol. 4, No. 1, pp. 134-147).

Glassner, A., & Back, S. (2020). *Exploring heutagogy in higher education: Academia meets the Zeitgeist*. <https://doi.org/10.1007/978-981-15-4144-5>

Guan, C., Mou, J., & Jiang, Z. (2020). Artificial intelligence innovation in education: A twenty-year data-driven historical analysis. *International Journal of Innovation Studies*. <https://doi.org/10.1016/j.ijis.2020.09.001>

Haleem, A., Javaid, M., Qadri, M. A., & Suman, R. (2022). Understanding the role of digital technologies in education: A review. *Sustainable operations and computers*, 3, 275-285. <https://doi.org/10.1016/j.susoc.2022.05.004>

Hofer, S. I., Nistor, N., & Scheibenzuber, C. (2021). Online teaching and learning in higher education: Lessons learned in crisis situations. *Computers in Human Behavior*, 121, 106789. <https://doi.org/10.1016/j.chb.2021.106789>

Imamov, M. & Semenikhina, N. (2021). The impact of the digital revolution on the global economy. *Linguistics and Culture Review*. <https://doi.org/10.21744/lingcure.v5nS4.1775>

Khan, T., & Thomas, S. (2022). Promoting Positive Education through Constructivist Digital Learning Heutagogy: An Intervention Outcome. *Journal of Learning for Development*, 9(2), 305–316. <https://doi.org/10.56059/jl4d.v9i2.646>

Kusdiyanti, H., Zandra, R. A., Wijaya, R., Febrianto, I., Rosyidah, U. J., & Kalbuana, N. (2024). Development of Heutagogy Model as a Framework to Prepare a Self-Determined Educator: A Case Study in Indonesia. *Journal of Intercultural Communication*, 24(3). <https://doi.org/10.36923/jicc.v24i3.820>

Laine, S., Myllymäki, M., & Hakala, I. (2021). Raising awareness of students' self-directed learning readiness (SDLR). In *Proceedings of the International Conference on Computer Supported Education* (pp. 439–446). <https://doi.org/10.5220/0010403304390446>

Orús, M., Latorre-Coscolluela, C., Toledo, S., & Sánchez, V. (2020). The technological challenge facing higher education professors: Perceptions of ICT tools for developing 21st century skills. *Sustainability*, 12(13), 5339. <https://doi.org/10.3390/su12135339>

Moore, R. L. (2020). Developing lifelong learning with heutagogy: contexts, critiques, and challenges. *Distance Education*. <https://doi.org/10.1080/01587919.2020.1766949>

Perchard, S. R. (2022). Engagement through Emancipation, Empowerment, and Equity: Heutagogy and the 21st-Century Classroom.

POGHOSYAN, L., TOPUZYAN, A., & HARUTYUNYAN, G. (2024). HEUTAGOGY AS A MODERN CONCEPT OF SELF-EDUCATION. *Main Issues Of Pedagogy And Psychology*, 1(11), 71–82. <https://doi.org/10.24234/miopap.v1i11.20>

Putra, A., Sumarli, S., Tee, T., Yoto, Sutadji, E., & Rahmawati, A. (2023). The heutagogy model of learning innovation in increasing the skill needs of the digital era of vocational students. In *Proceedings of the Unima International Conference on Social Sciences and Humanities* (pp. 39–49). https://doi.org/10.2991/978-2-494069-35-0_7

Qureshi, M. I., Khan, N., Raza, D., Imran, A., & Ismail, F. (2021). Digital technologies in education 4.0: Does it enhance the effectiveness of learning? A systematic literature review. *International Journal of Interactive Mobile Technologies (iJIM)*, 15(4), 31. <https://doi.org/10.3991/ijim.v15i04.20291>

Servant-Miklos, V., & Noordegraaf-Eelens, L. (2021). Toward social-transformative education: An ontological critique of self-directed learning. *Critical Studies in Education*, 62(2), 147–163. <https://doi.org/10.1080/17508487.2019.1577284>

Song, Z., Wang, C., & Bergmann, L. (2020). China's prefectural digital divide: Spatial analysis and multivariate determinants of ICT diffusion. *International Journal of Information Management*, 52, 102072. <https://doi.org/10.1016/j.ijinfomgt.2020.102072>

Stoten, D. W. (2020). Practical heutagogy: Promoting personalized learning in management education. *Adult Learning*. <https://doi.org/10.1177/1045159520905364>

Tougas, R. (2024). Resisting and disrupting neoliberal subjectivity in self-directed education: What can we learn from black homeschoolers? *On the Horizon*. Advance online publication. <https://doi.org/10.1108/OTH-03-2024-0010>

Vinayan, G., & Harikirishanan, D. (2021). Empowering Heutagogy for 21st Century Learning. *Systematic Literature*

Review and Meta-Analysis Journal, 2(2), 47-52. <https://doi.org/10.54480/slrn.v2i2.17>

Volberda, H. W., Khanagha, S., Baden-Fuller, C., Mihalache, O., & Birkinshaw, J. (2021). Strategizing in a digital world: Overcoming cognitive barriers, reconfiguring routines and introducing new organizational forms. *Long Range Planning*, 54, 102110. <https://doi.org/10.1016/j.lrp.2021.102110>