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Circular Pedagogy and Digitisation A New Educational Paradigm

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Circular Pedagogy and Digitisation A New Educational Paradigm

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Abstract

Existing educational systems and models are insufficient to address the challenges associated with our evolving socio-economic and environmental systems. In this paper, we offer critical insights on the core elements defining Higher Education Institutions, the digitisation of teaching and learning practices with a dominant trend favouring STEM education that overlooks the value of social sciences. The neglection of social sciences and the criticism and negative connotations that affect research in the field of pedagogy are also considered as they are essential in articulating our vision of the need for pedagogical innovations that acknowledge our new learning and teaching realities and the importance of introducing new practices that help on the transition towards a new educational paradigm. We propose a new pedagogy called Circular Pedagogy, where the role of the teacher, the learner and the researcher are identified as interchangeable over the lifelong learning process. Our research offers some initial insights into how Circular Pedagogy can be connected to Bloom's Taxonomy as we are at the early stages of developing the theoretical foundations of this new pedagogy.

Keywords: Circular Pedagogy, Digitisation, Bloom Taxonomy, Education, Paradigm

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Introduction

Over the past four decades, there has been an information explosion that can be traced back to the mid-1980s. According to a UNESCO report (1984), increasing amounts of information has created significant challenges to the learning process as a result of rising levels of complexity and imposed demands on teachers and learners. As the years have passed, the situation has increased in complexity as we are fully immersed in the Digital and Data Ages. Digital technologies have contributed to expanding the boundaries of information, leading to significant changes in how people interact with information, engage with data analysis and utilise fast-evolving tools to enhance human productivity. On the other hand, several risks have emerged, as the intensive use of technology has brought a different range of risks where people's well-being is being affected (OECD, 2019). We are facing continuous job losses, increasing cost of living, rising levels of violence and insecurity, and dramatic changes in bullying trends driven by cyber-bullying, to name a few of the ongoing challenges. Growing levels of uncertainty are a significant source of distress for our societies, compounded by cybersecurity problems, personal data breaches due to online security and privacy and the overall misuse of personal information because of the lack of awareness and understanding of how to manage digital tools and data sharing processes. Data availability is subject to massive change and progress, driven by technological advances and innovations that have led to the demand for different competencies and skills.

In parallel, the educational field is facing additional challenges as we face dramatic changes due to the natural evolution of sciences and the demands of our society. The pace of change requires new ideas, new ways of working and different approaches towards problem-solving processes, teamwork and collaboration. Within this context, we argue for the importance of pedagogy as the digitalisation of the learning process requires a different approach to teaching, learning and engaging in research activity. Our Higher Education Institutions (HEIs) need to offer guidelines, drive change and provide informed procedures to help our society transition towards more sustainable educational and working models. As part of the initial transition, we argue in favour of active and proactive involvement from the academic and research community to avoid isolation and limitation to learning environments that do not integrate insights from cutting-edge research contributions. In particular, Technological Education skewness towards STEM disciplines is quite concerning as the human dimension of our educational system needs to integrate social sciences. Furthermore, there is evidence of solid criticisms emerging towards pedagogy and its value to support learning and teaching, with a lack of insight on its significance towards research. The educational framework requires new ways of thinking and new approaches to learning that bring flexibility, adaptability, and critical and open mindsets that nurture transdisciplinary and proactive learning environments if we seek to offer a practical and constructive response to existing and emerging challenges.

Unfortunately, the importance of pedagogy within Higher Education is quite controversial, as historically, pedagogy has been closely associated with children's education. The extant literature offers interesting evidence on how the word pedagogy can be associated with different interpretations and understandings, generating confusion and leading to misunderstandings that prevent its development and limit its contribution to the educational system. The evolution and exigencies of HEI have not helped regarding the negative connotations associated with pedagogy that

can be highly ambiguous to the non-experts, as the scientific literature in the field can be quite challenging and, in some instances, perceived as unapproachable.

In the context of our contemporary society and its ongoing demands, scientific knowledge should be accessible and not limited to close groups of scientists or academics. Furthermore, there is a need to address the significant gap between the use of technical language associated with the pedagogical field and its transition to practical contexts that provide insights into the significance of pedagogy to support of the learning process and how students, teachers and researchers can benefit from it. Surprisingly, there is a significant research gap linking pedagogy and research activities within learning environments, as we argue that research is a fundamental part of students learning and development, and it should not be kept isolated from the holistic view and understanding of what education is (Linder et al., 2007; Hubbard & Dunbar, 2017; Romero, 2019).

Furthermore, we need to consider that countries are facing significant dilemmas as they seek to respond to the demands that fast-evolving technologies are imposing on learners. This translates into the need for updated, flexible, agile and proactive educational systems and models that align with our society's needs. To add further complexity to the work to be done by HEIs, we think that the role of economic and political systems and the continuous deterioration of our ecosystems cannot be left outside of the educational framework. Students, teachers and researchers require new ways of working and understanding their evolving reality. As such, pedagogy emerges as a critical area of research and practice within the Higher Education landscape. This research paper provides a critical and reflective insight into the need for new and alternative educational paradigms that provide insights on how we can move forward with innovation in our educational sector as we navigate the challenges associated with the Digital and Data Ages.

In Need of a New Educational Paradigm

The world economies are reshaping and in an influx process that requires a better understanding of global dynamics and adjusting mechanisms. The implications for global societies, their impact on our daily routines, and how to act in a way that does not affect future generations and challenges their opportunities for a quality and balanced life. The concept of world citizenship or global citizens is frequently used to highlight the need for change, due to the necessity of developing cognitive abilities that allow us to realise and understand that our future is defined on daily basis by our individual and collective contributions. Through different kinds of actions and interactions of the individual with the environment, with society and with the economic and political systems, we play a critical role in transforming our way of living. We are engaged in a circular process where we are continuously exposed to a constant flow of growing volumes of data that needs to be transformed into valuable information that helps us navigate the different learning and development stages. We have an individual and collective role to play as we redefine our socio-economic and political dynamics and identify the contribution we aim to make to our society and environment.

We rely on education and its capacity to drive change to transform how we work, interact, reflect and reconsider our global role. However, our educational system does not possess the strength, flexibility and capabilities to help us address existing and emerging challenges. As such, we argue for the need to transform education. We need to build a different mindset that integrates the development of human beings from a holistic angle that starts from the early stages of development up to adult life

articulated within global hyper-complexity environments (Chu & Karr, 2017; UNESCO, 2018; UN, 2020; Darling-Hammond et al., 2020; European Union, 2021; Timar et al., 2022).

New approaches to learning, teaching and research require an intense reflection on existing educational models that provide a foundation for new proposals that help identify innovations to what is already known, helping us to learn from our foundations. As such, insights from existential models in education are relevant as they help clarify what we can consider educational activities and what is understood as pedagogy. If we take into account global challenges and their complexities, we argue that our sciences, research, and educational activities are critical to our survival. Under these conditions, we need to design a new educational model that facilitates the transformation of the entire education process. The growing levels of data and how it can be filtered and analysed in a way that becomes information that can be integrated as part of learning processes to ensure that we are well-informed, keep updated, flexible, agile, and connected with our evolving reality. Research activity is critical for our development and our ability to progress and find alternatives to existing business models that drive our current educational demands. While the labour market is critical in enabling our societies to prosper, we cannot overlook the importance of knowledge not purely focused on economic or political means, as education is vital to enable the social transition towards sustainable development. Therefore, a new educational paradigm is needed.

We are not proposing a new idea regarding the importance of transforming education, an argument supporting the need for change has already been made and it can be identified on existing international reports and documents. We are highlighting and underlining the importance of the scientific domains, and in particular the work done at Technological Universities that could emerge as an interesting alternative to education and its conception. Education is not an exception, in our view and in alignment with existing research education is the engine for sustainable transformation (UNESCO, 2018; Morales et al., 2022; Pop et al., 2022; WEF, 2023; Stefan et al. 2023). Our view supports the vision of education as the engine for needed transformations that will guide and disrupt existing socio-economic and environmental models.

Historically, education has been the response to social demands and needs to keep progressing. On the other hand, education's main characteristic is that it is dedicated to humans only, and it is meant to bring humans to their best existence and to unfold and support the development of their potential. In this regard, education is essential as a tool to drive change, innovation and transformation and as such it is paramount to work around process where we "think human first" as we question and provide alteratives to our existing unsustainable development trends, models and practices (Mason, 2014, 2018; Hofman-Bergholm, 2018; UNESCO, 2018; Holfelder, 2019; Kioupi & Voulvoulis, 2019; UNESCO, 2022; Parry & Metzger, 2023).

Education is quite complex because it directly links with individual, social evolution, and life experiences. Currently, education is directly interconnected with the digitalisation waves, so we have to increase the awareness of opportunities and challenges related to the use of technology and be even more focused on transforming existing paradigms, including educational paradigms, as stringent actions and attitudes. In this regard, the pedagogical field offers enormous potential due to the significant number of elements that should be analysed and reinterpreted in our shared supercomplex learning environments (Richardson & Milovidov, 2019; UNESCO, 2020; Cheung et al., 2021; UNESCO, 2021; IAU, 2022; Flores-Vivar & García-Peñalvo, 2023). In the early stages of pedagogical research,

pedagogy was considered the science of education because the study object of pedagogy was framed and focused on education. However, as a result of the natural evolution of other sciences like psychology and neurosciences, it has emerged that pedagogy alone cannot cover the entire spectrum associated with educational phenomena, highlighting the need to open to other disciplines that contribute to broadening our understanding of education.

Consequently, we are currently discussing Educational Sciences and pedagogy as just one element of this spectrum. Despite this, many mismatches and misunderstandings generate tensions between professionals using pedagogy, leading to very different meanings and applicability. This fact feeds not only into the historical war between what have been identified as hard science and soft science, with all the negative connotations around it that have led towards negative, marginalised and denigrating views of the so-called "soft sciences." Quite worryingly, we are facing increasing tensions among different groups of academics and researchers that share the same field but that disagree on fundamental aspects of what pedagogy is about as we take into consideration different geographical areas, cultural backgrounds, personal beliefs and the impact of existing trends that are also affected by different levels of educational development and attainment (Cristea, 2010; Jinga & Istrate, 2009; Piaget, 1972; Ridley, 2015; UNESCO, 1972; TWI2050, 2019; Nadkarni & Prügl, 2021; European Economic and Social Committee. et al., 2020).

Undoubtedly the interaction and knowledge exchange across different disciplines is vital as we aim to understand different epistemological arguments, become aware of fundamental concepts of pedagogy and their valid theoretical transferability into teaching activities and the essential role that they play in increasing the levels of efficiency and efficacy of educational processes in all disciplines (Lee et all., 2013; Van Der Linden & McKenney, 2020; Chang et al., 2021). In this framework, different sciences and mini-sciences have appeared in the pedagogical field, with mini-sciences incorrectly being communicated as educational science as they are affected by significant limitations due to their low educational impact (Linder et al., 2007; Sjöström et al., 2016; Tuomi, 2018; Sjöström & Eilks, 2020; UNESCO, 2021; Holmes et al., 2022; Jones & Burrell, 2022). Furthermore, the artificial cohabitation of normative prescriptive and descriptive practical science and the forced or spontaneous and chaotic overlap between the multidisciplinary, interdisciplinary research methodologies of education and instruction add further confusion to the field. Moreover, the negative interference between internal and external multidisciplinary elements are leading to ineffective theoretical frameworks were generated contributions arebcreating further misunderstandings as we try to identify how we can progress and make a constructive contribution to education and its needed transformation (Weiss & Wodak, 2003; Youngblood, 2007; Noddings, 2016; WBH, 2020).

At this point, it is essential to reflect on how postmodern education was framed in a curriculum paradigm (Dewey), as this is the most recent paradigm that integrates global directions that call for new pedagogical insights. There is a need for adequate support within specific psychosocial needs embedded into concrete contexts that foster the continuous development of human potential. In addition, the increasing complexity and diversity of learning environments pose further difficulties through the continuous exchange of roles between the peer educator-educated, personality-society. In alignment with the postmodern pedagogical hypothesis, the actors of education became authors of education in a permanent and open education space, following an auto-education format that integrates all contents and forms of education (moral, intellectual, technological, esthetic, physical, formal, nonformal informal) (Zajda, 2005; Mansour, 2009; Noddings, 2016; Krasny & Slattery, 2021).

From this perspective, postmodern education represents a global and open approach to education and instruction and the design of education and instruction specific to the curriculum paradigm. Therefore, at this point, we argue the need for new epistemological and social relations between diversity and unity of education that we summarise on the following points.

A. The significance of a theoretical framework that considers an applied pedagogy that acknowledges our current context where the educational system is facing significant challenges and new types of University models are needed. In the specific context of Europe, major efforts are being made to promote different University Alliances that bring change to European Educational models. To enable the changing process, we need strong foundations and a solid theoretical framework that provides insights from the general theory of education, the general theory of instruction, and the general theory of curriculum is relevant as it helps in articulating the notion of educational design in the context of European Alliances.
B. The development of an up-to-date methodological and practical framework in order to develop the different applications of disciplines and contexts by exchanging knowledge with other academic institutions' representatives and stakeholders. It is paramount that we are open to testing and experimenting with different pedagogical scenarios. We also need to establish a clear conceptual and pragmatic delimitation in the context of inter-puri and transdisciplinary methodologies (Cronin, 2008; Lawrence et al., 2022; Archibald et al., 2023)

The importance of a new educational paradigm takes more relevance in the context of the mentioned European Alliances, and more specifically, as we take into consideration the European University of Technology (EUt+), which is the researchers' current working space. Our working reality and evolving learning environments are defined by their significant levels of diversity. We are trying to identify ways of learning, teaching, researching that help us work together. We need to create a space in which valid elements are reinterpreted throw the lens of inclusivity, diversity, care, belonging, smart education, and complex learning environments as we try to define our contribution to the development of a new educational model guided by innovative approaches as we put forward the novel concept of Circular Pedagogy (Morales et al., 2022; Pop et al.., 2022; Demir, 2021; UNESCO IITE, COL & BNU, 2022).

Conceptual Delimitation of *Circular Pedagogy*

Context

The context of our novel circular pedagogy is focused on rebuilding the pedagogical domain in the context of Technical Universities across Europe synthetically and flexibly by considering/analysing internal aspects of education and external relationships within the learning environment and guided by educational principles inspired by the teachings of Humbolt, Piaget, Nicolescu and Kuhn where we are seeking to make a contribution on the need to change epistemology and in this way hopefully teaching practices. Circular Pedagogy emerged as a disruptive and innovative concept as a result of the work done by some members of the European Laboratory for Pedagogical Action - Research and Student-Centred Learning (ELaRA) research team working at EUt+ that is explained in two seminal papers where the authors discuss the basic elements of Circular Pedagogy and developed an initial

connection with technology education through the importance of Smart education (Morales et al., 2022 and Lia et al., 2022).

Orientation

Circular pedagogy reconsiders the fundaments of pedagogy in a complex, systemic, and flexible manner. We aim to generate a valid balance between local and global contradictions, national and international demands, side effects of multidisciplinarity, efficient use and overuse of technology and their implications for education. Our working context is supported by a careful review of published reports that examine differences between what can be understood by being an educator and being educated. The scope is to generate the fundaments of the domains by considering the" old" and" new" schools of thought in pedagogy as a testbed for present and evolving contexts of education. Within the context of EUt+ we argue on the need for different approaches towards education that are conscious of STEM dominance and the significance of integrating social sciences through a transition towards STEAM as we provide a context of a collaborative educational model where all disciplines', lines of thought and research contributions are welcome and cherished.

Within our working framework, we deem necessary the introduction of innovative pedagogies that support disruptive ways of thinking and that offer alternatives to students, teachers and researchers as the role of the teacher becomes more in alignment with being an educator and a proactive enabler of transformation and change. The basic elements of circular pedagogy are outlined in Figure 1 below as we understand the role of the teacher, the student and the researcher as being interchangeable, and that gravitate toward learning environments defined by diversity, the need for learning autonomy, and the development of cooperative attributes through active learning practices. The learning environment requires consideration of the discipline and development of expertise through a holistic dimension that contributes to developing needed competencies enhanced by a continuous feedback process between the teacher, the student and the researcher in their interchangeable roles (Morales et al., 2022 and Pop et al., 2022).

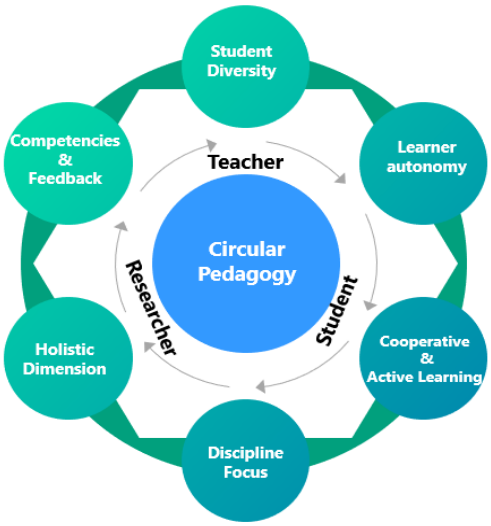

Figure 1: Circular Pedagogy. Source: Authors (2023)

Epistemological Model of Knowledge Applied to Circular Pedagogy

In the pedagogical field, it is well-known that the epistemological domain is subject to a fuzzy status where the differentiation of common knowledge from scientific knowledge is not straightforward. These limits relate to the specifics of the study object-education. As is the case of every human and social science, the epistemological reference in pedagogy is vulnerable to multiple critics because the logical syntax, the semantics of the language, and the pragmatics of the scientific speech are not yet well articulated. The logical syntax of pedagogy is vulnerable because of the inconsistency of the statements and the tendency to approach particular issues before the general ones, and the existing overlap of specific science on fundamental sciences of education or promoting "new sciences of education" when in fact they are just applications of other sciences of education without any epistemic and social effort to relate them to the fundamental sciences of education.

Another critical aspect from a practical viewpoint is the semantics of the pedagogical language. There are significant areas of concern in the practical domain due to the growing gap between the views and ideas presented in the dominant literature and their feasibility. As a major concern, the lack of applicability to daily practices creates important limitations due to the instability of the concepts. Moreover, further complexities emerge due to the lack of consensus among researchers on the value and significance of pedagogy and its best practices, which are not helpful to practitioners who need solutions to manage complex and conflicting situations affecting their working environments. Therefore, and quite often, it is possible to identify that existing concepts, theories, research positions and ideas can be articulated differently or even in opposite directions as they are subject to individual interpretations. This situation can create significant levels of confusion for teachers needing applicable solutions and counterproductively lead to the rejection of the pedagogy in general. This situation is specific to the epistemological immaturity of science when fundamental concepts of pedagogy are mixed with operational pedagogical elements and with the unconditional takeover of concepts from other disciplines without providing the specific character that defines interdisciplinarity.

On the other hand, the pragmatism of pedagogical scientific discourse needs and must be improved due to social demands, economic and political pressures and, more lately, significant challenges faced by the deterioration of our planet as a result of the abusive exploitation of scarce natural resources. For decades, we have been facing the aggravation of a global educational crisis (Coombs, 1985), and this is probably due to the apparent impossibility of pedagogy to design and implement efficient educational actions and practical scenarios that can add value to our society from its micro dimension towards a more macro type of approach. A potential explanation for this situation seems to be the incoherence of the relations between the theory, methodology, and practice of education and training in the context of the global social system and those associated with the demands of the learning process. New global challenges and supercomplex environments claim for a deeper analysis of what means education and pedagogy in our days and how they should be delivered from a top-down and bottom-up approach that functions dynamically.

Some emerging questions from our research findings and as we consider the importance of innovation within the pedagogical working context are outlined as follows: What are the main goals, ideals, scope,

and objectives associated with pedagogy? What structure should we have, and what content should we design for a sustainable future? What is the role of pedagogy in advancing the future of education? In order to respond to the outlined challenges, we need to design a new epistemological framework of pedagogy, starting from general pedagogical epistemology and developing future-specific epistemologies that enable us to build a new pedagogical framework (DeAgostini, 2004). In our working context, we are looking at three fundamental aspects that can help us progress, and those are identified as follows.

1. Firstly, internal consistency within our working educational theories is needed. We need to clearly define fundamental concepts of pedagogy and operational concepts by reporting them to the articulation of a coherent theory and methodology.
2. Secondly, engaging in a testing and experimenting process is critical to gathering relevant information to help us redefine our theoretical framework. Testing the theory at a practical level in a different context and normativity and within the context of Technological Universities where EUt+ is considered as the main case study.
3. Thirdly, the proposed theory's efficiency will consider the development of appropriate metrics that help us measure its capacity to identify and give proper answers to educational problems.

HEIs need to change their practices and educational approaches, and this means that there is a need to change the epistemology of teaching. To enable an efficient process of change, we need to consider and synthesise existing epistemological models in pedagogy to help us understand the main arguments and ideas and how they can be used to support innovative practices. The extant literature provides essential insights into solid and well-settled epistemological models in pedagogy like Critic Realism from Popper (1902-1994); Structure of Scientific Revolution from Kuhn (1922-1974); Scientific Research Programs from Lakatos (1922-1974), Anarchist Theory of Knowledge from Feyerabend (1924-1994); and the Formation of the Scientific Study from Bachelard (1884-1962) to name a few.

Existing models are defined by their positive aspects and also by their limitations which must be considered and analysed to try to overcome the present epistemological, pedagogical crises affected by strong criticism of their value and that support the need to introduce new paradigms that take into account the rational reconstruction of our research realities based on fundamental pedagogical concepts well defined and based on general methodology. Simultaneously, we need to consider the history of the scientific paradigms as key elements without neglecting dominant pedagogies or lines of thought. The relevance of a synthesis paradigm can help us in the development of a new pedagogy, supported by the methodological insights associated with grounded theory and consolidated approaches followed in the educational research literature.

Our theoretical framework is supported by research activity that seeks to reconstruct the research object of pedagogy in a rational manner. Elements that take relevance in our way of working relate to the need to have an educational understanding that is more connected to the context of postmodern society, economic and environmental challenges following the rational reconstruction synthesis and the historical progress of pedagogy with heavy influence from hermeneutics that shed light on our pedagogical contexts and transdisciplinary approaches. All the outlined elements are an essential part of postmodern epistemologies, and significant contributions made by researchers over the years (Cristea, 2010; (Gattei, 2009) (Schilpp (ed), 1974) (Popper, 2009) (Audi, 2011) (Rescher, 2003) (Kuhn,

1970) (Popper, 2002) (Popper, 1966) (Freyerabend, 1993) (Agassi, 2014) (Lakatos, 2005) (Smith, 2016) (Tiles, 1984). In the next section, we bring some initial insights into how our Circular Pedagogy can function as we carefully analyse a consolidated learning Taxonomy. We provide critical insights that help us articulate the need for change and how we visualise the process.

A Progressive and Dynamic Educational Process

In this framework, built from many elements presented in the reviewed pedagogical literature, we connect Circular Pedagogy to the well-known Bloom's taxonomy. This is the initial stage in articulating a connection between existing knowledge and how we define and position Circular Pedagogy (Anderson & Krathwohl, 2001; Sobral, 2021; Sudirtha et al., 2022). We are providing a practical example of how we can articulate the basic elements associated with Circular Pedagogy, where the teacher, the student and the researcher interchange their positions as part of a dynamic and ever-changing learning process. Some of the basic elements of the novel pedagogy are outlined in Figure 01, and discussed in seminal papers that introduced the novel pedagogical concept as reflected in the work developed by Morales et al. (2022) and Pop et al. (2022). Our working context is strongly associated with creating transformative learning environments that require developing learning and teaching spaces that align with the student-centred paradigm when considered appropriate.

Furthermore, learning environments should become dynamic and interactive learning spaces capable of responding to teachers, students and researchers' teaching and learning needs. Therefore, the design of digital-driven learning spaces should consider integrating technology and innovation as enablers and enhancers of learning and teaching activities that contribute to knowledge-sharing and co-creation. The design process should consider the growing danger of shifting the emphasis towards technologies and forgetting that technologies and innovations emerge as tools to facilitate learning and teaching processes.

Consequently, technologies and innovations should not take the central stage, as they should be understood as enablers and not as the focus. Another aspect to be considered relates to incremental levels of complexity associated with learning activities and how they should guide students and learners as they move along the different stages of Bloom's Taxonomy, as outlined in Figure 2 below. We propose dynamic learning environments that function in a context that acknowledges bidirectional and dynamic levels of complexity, where students and teachers reflect on learning and development needs that enable the co-creation of effective learning environments. As a result, learning environments should be designed and guided by adaptability and agile response systems that enable teachers and students to navigate the complexities imposed by technologies and their fast pace of development (Anderson et al., 2001; Churches, 2008; Stanny, 2016).

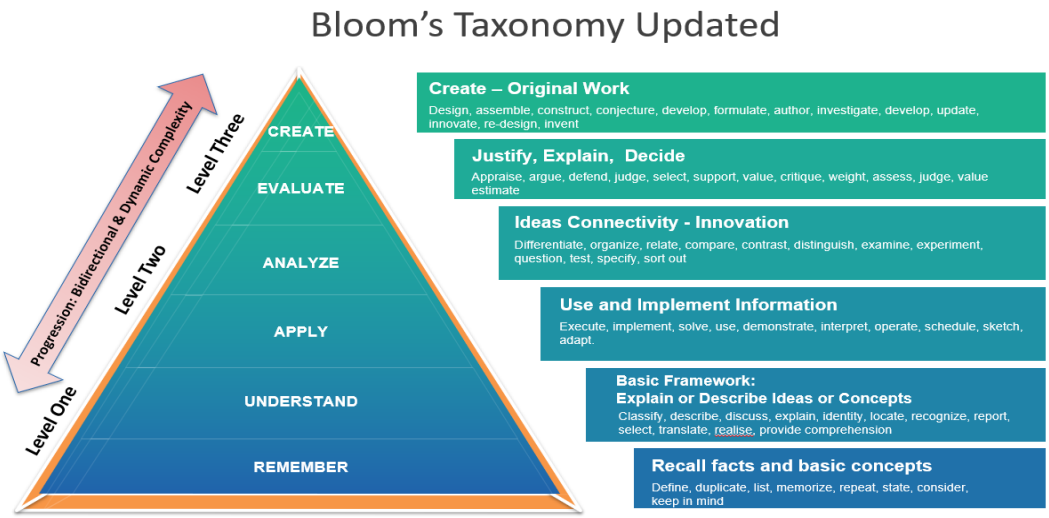

Figure 02: Bloom's Taxonomy – A Progressive and Dynamic Model. Source (Authors, 2023 – adjusted from Anderson's Update on Bloom's Taxonomy)

The learning process is associated with a bidirectional learning dynamic that acknowledges different difficulty levels as students transition from a basic level of knowledge towards a stage where they can create, co-create and/or innovate. The Bloom's Taxonomy considers the learning experience as an individual and isolated process focused on the individual student. An aspect to be considered within updated transformative learning spaces is the transition towards learning spaces that contribute to the co-creation of original work as the individual must collaborate, cooperate and work as part of a learning team. The learning environment should facilitate the transition from simple learning towards a more complex level where the learner considers the need to collaborate, participate, inquire and debate, leading towards knowledge sharing and co-creation.

Students should be able to grasp basic concepts and start a learning progression where they can develop appropriate competencies to move towards higher levels of learning complexity where the students can create and/or co-create original work. The learning process will require significant adjustments driven by the evolving nature of innovation and technology. As such, teachers, researchers, and students should be able to move along Bloom's taxonomy as needed and dictated by individual and collective learning needs so that they can become active and proactive collaborators and co-creators of knowledge.

Paradigm Shift in Education – Technology to Support in Teaching & Learning

The concept of paradigm changes or shifts in sciences was pioneered by Kuhn (1970), as he argued that change does not occur in a step-by-step way or through some type of accumulative process. Change is associated with complex dynamics and disruptive processes that challenge existing knowledge and require competencies that enable flexibility, adaptability, and dynamic learning that evolves as the learner grows and develops and that is caputered by the concept of life-long learning, as illustrated in Figure 03 below.

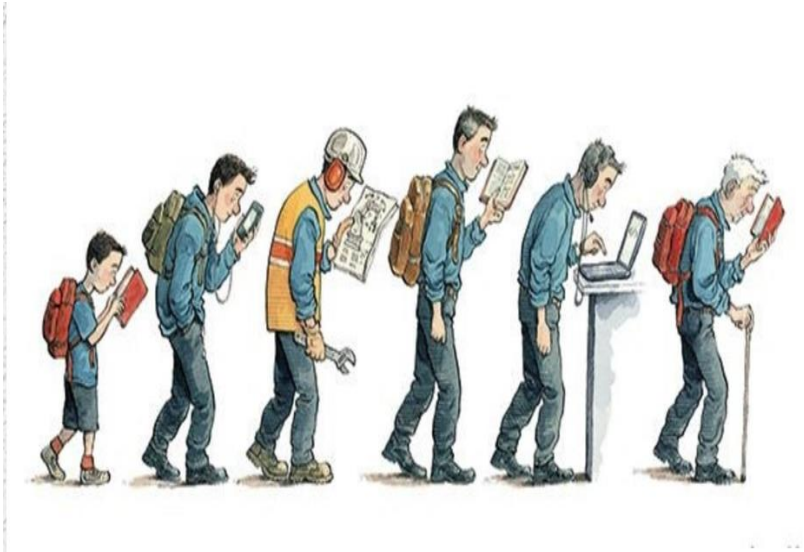

Figure 03: Lifelong Learning. Source: The Economist (2017)

The term "paradigm shift" started to be used in education to think about needed changes. We understand a paradigm shift in existing educational models as the need to provide transformative learning spaces. We are immersed in processes of significant change and challenges derived from the digital and knowledge economy that demands the development of new competencies that simultaneously require more sophisticated learning environments. Educational models are in need of change because of new socio-economic dynamics and learners' diverse needs and demands. Our current paradigm shift is significantly impacted by fast-evolving technologies and innovations that demand higher adaptability, agility and flexibility. New learning spaces should promote the development of autonomous and self-regulated learning processes as learners take ownership of their development and progress. Therefore, the concept of learning autonomy takes relevance as we reexamine the work of Vygotsky's (1978) and his concept of self-regulation and the significance of working on flow dynamics introduced by Csikszentmihalyi's (1990) that can be associated with dynamic levels of learning captured by Bloom's Taxonomy and that are captured in figure 04 below.

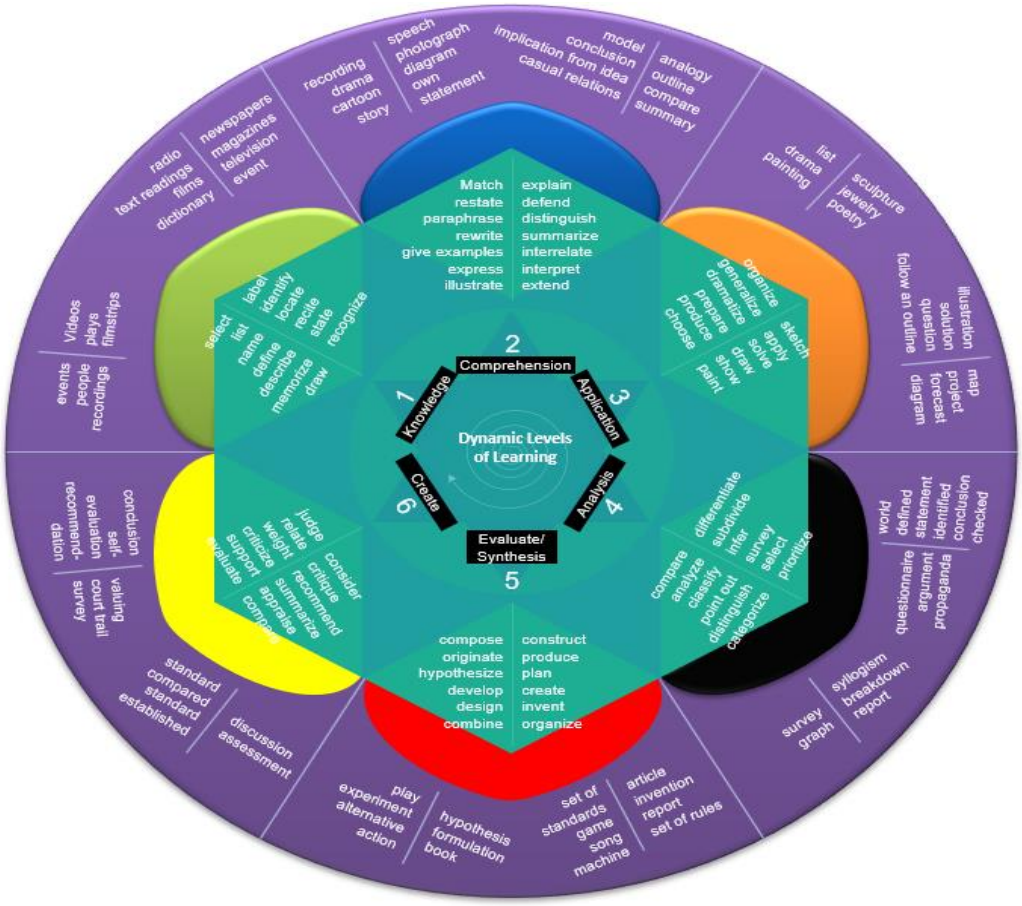

Figure 04: Bloom's Taxonomy from Passive to Active Learning – Circular Action. Adapted from West Virginia University

In parallel, higher education institutions are facing dramatic changes due to the lifelong learning process and ongoing pressures from the labour market that demand continuous reskilling, upskilling and the development of new competencies. The diversity of the student population demands new levels of support towards teaching and learning activities to foster learner autonomy and embrace active learning spaces where teachers and students emerge as active co-creators of the learning process. The separation between learning and teaching activities from work done by researchers is a significant area of concern as research activity is closely associated with learning and teaching practices as we consider the role of lead and consolidated researchers and how they articulate required support to junior members of their research teams. Significant changes need to be considered as part of current practices at HEIs that insist on separating research activity from the work that takes place in the classroom, and that requires a connection to cutting-edge research that enhances the dynamicity and knowledge-sharing processes that should characterise and define our new educational models. As part of innovative learning spaces, we need to reflect on the basic features of our proposed new learning environments and how they are interconnected. The core points are outlined below and summarised in the Figure 05 that follows.

1. There is a need to acknowledge the diversity of the student population driven by lifelong learning challenges.

2. Assessment of learners' autonomy and self-regulation processes and how they can be efficiently articulated.
3. Nurture and foster Cooperative and Active Learning Processes.
4. Focus on Discipline/Meaning/Application and not on technology, except for those disciplines that are driven by technology and will require a different approach.
5. Holistic Learning – Multidisciplinary, Interdisciplinary and Transdisciplinary Dimensions (Challenges and Benefits).
6. Development of Critical Thinking, Analytical and Active/Proactive Skills.
7. Articulation of Curricular Design and Alternative Assessment.
8. Active, Constructive, Personalised and Authentic Feedback.
9. Rethinking the role of the teachers as they become co-learners, as we transition towards a more holistic understanding of their role as they become identified as Proactive Educators.
10. Enable Teachers and students to become Co-creators of Learning Spaces.

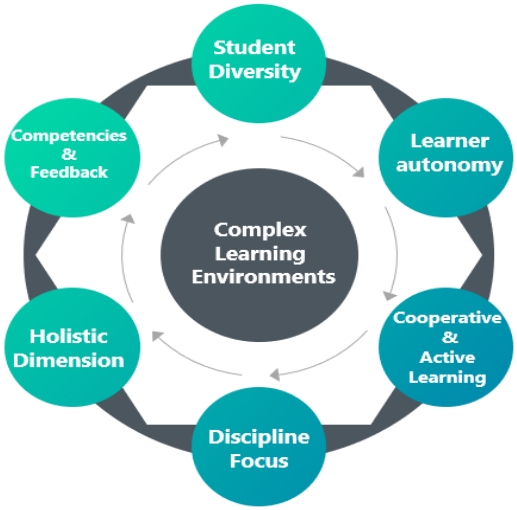

Figure 05: Complex Learning Environments. Source: Authors (2023)

Lifelong learning is closely connected to companies' and businesses' evolving and changing needs, creating different student expectations and additional pressures on teachers. Learning pressures are emerging from continuous changes in job roles and needed skills that require significant investment to develop new and updated competences. The learning process is now understood as "learning that happens throughout an individual's whole life." According to the Economist (2017), the practicalities of lifelong learning are daunting, as education is failing to keep pace with technology, leading towards undesired outcomes like increasing levels of inequality and significant stress on learners as they try to keep updated and not fall behind. Further challenges emerge from specialised and discipline-specific learning environments associated with higher frustration, disengagement and dropout rates, compounded by the controversies and lack of consensus among pedagogical experts about compelling practical insights that can be used to drive desired change.

Another aspect that requires consideration is that individuals with specialised training tend to withdraw from the labour force earlier than those who have opted for a more general education, suggesting that individuals with more generic skills are more flexible and capable of adapting to changes. Within the outlined context, it is of interest to consider some of the main challenges associated with a lifelong learning process and the complexities associated with it, which we identify as follows:

1. The learning process is not free; it requires significant levels of investment and individual commitment to engage with free learning resources and the costs associated with formal education.
2. Time-consuming – an opportunity cost associated with the learning process can result in significant stress levels as students try to balance their professional commitments, family life balance, and find time to engage in learning activities.
3. A diverse student population brings new changes as learners require different types of support based on their different experiences and knowledge levels, which can create friction between learners and teachers.
4. Acknowledgement of mature students' demands and expectations
5. The costs associated with Universal Design for Learning and the implications in terms of its practicality and implementation.

Conclusions

In this paper, we argue for the need to reconsider our educational models and existing practices within HEIs and the importance of transforming education by making innovative contributions to pedagogy. Our discussions and reflections considered the significance of engaging with the existing literature from a constructive and critical perspective that allows us to provide a solid conceptual framework for our proposed new pedagogy. Circular Pedagogy is defined by its dynamicity and flexibility as we bring together the role of the teacher, the student and the researcher as they navigate the lifelong learning process through their interchangeable roles. Our discussions provide insights into how research, learning, and teaching activities must remain the central focal point of the student-centred learning space that needs to be supported by technology and innovation. Significant controversy surrounds pedagogy, and we argue on the need to take a more holistic approach towards education that helps us to bring a closer connection between theoretical discussions and the need for practical examples that teachers, researchers and students can use. In our future research, we propose developing a more detailed analysis that builds on the material presented in this paper, where we explore the role that pedagogy can play in transforming our educational systems and dominant models that we will articulate within the framework of Technological Education.

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