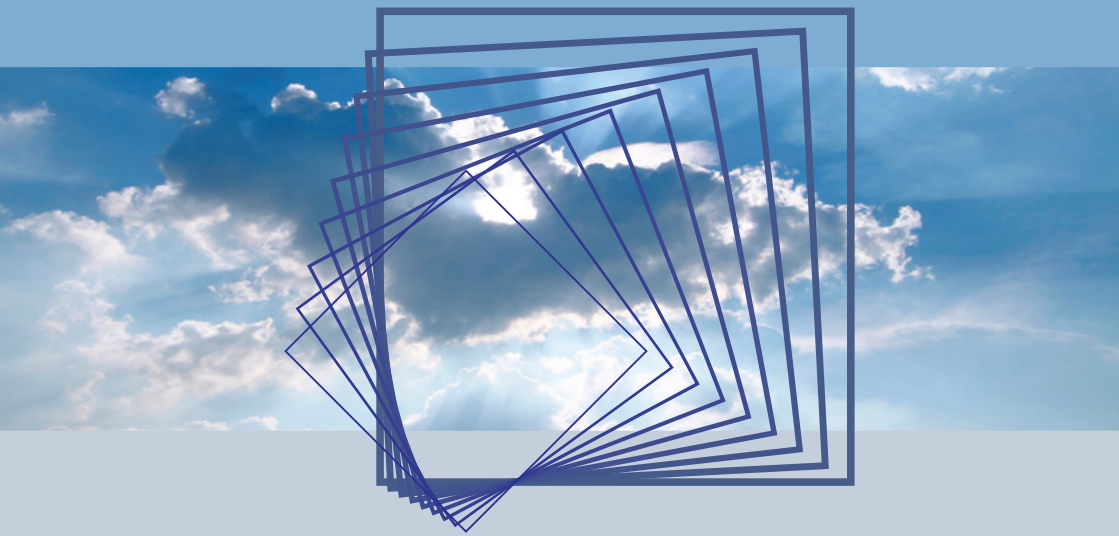
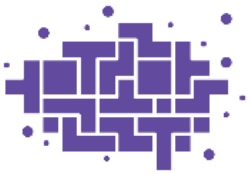


TRANSFORMATIVE DIGITAL LEARNING:
Emerging Cases and Considerations



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Implementation of Transformative Digital Learning in Doctoral Program of Pedagogical Science in Latvia (DocTDLL) lzp-2018/2-0180

Transformative Digital Learning: Emerging Cases and Considerations

Rezekne 2021

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SECTION 1. INTRODUCTION

1.1. VELTA ĻUBKINA

About the project "Implementation of Transformative Digital Learning in Doctoral Program of Pedagogical Science in Latvia" (DocTDLL) lzp-2018/2-0180

The collection of reviewed articles entitled "Transformative Digital Learning: Emerging cases and considerations" is a research-based issue that is rooted within the framework of the Fundamental and Applied Research Project launched by the Latvian Council of Science "Implementation of Transformative Digital Learning in Doctoral Program of Pedagogical Science in Latvia" (DocTDL) lzp-2018/2-0180.

The goal of the project was to create new knowledge and technological know-how in the field of transformative digital learning (TDL) in higher education in Latvia based on the theoretical analysis, experience of the technological laboratory (EILAB) of the University of Ontario (Canada), and empirical research to ensure transfer of knowledge and skills in the further development of the doctoral study program in Education Sciences with the focus on pedagogy, as well as the development of scientific and academic capacity of doctoral students and educators.

The project has been implemented by interdisciplinary group of Rezekne Academy of Technologies (Latvia) with participation of the colleagues of the University of Ontario, EILAB, which enabled the renewal of human capital resources in the development of science, technology and innovation, involving doctoral students and educators in the performance of the research and dissemination of project findings in higher educational institutions of Latvia.

Certainly, the theme and problems addressed are too wide and complicated to be covered completely by a short-term limited in scope project. Therefore, the published articles of the researchers, as well as this collection offer results that proved to be most relevant in the practice of doctoral students and educators.

As a result of the project e-platform has been created for the introduction of innovative methodology in the study process, approved and prepared recommendations for using during the implementation of the worked-out course program and prepared modules in Latvian and English, organized seminars for educators and doctoral students to approbate and promote the results and prepare the theoretical and practical outcomes for implementation in the doctoral program of Latvia.

The research is based on innovation, technology transfer and sustainability for the development of innovative content and technologies (approaches, methods, techniques, modes) in the doctoral study program "Pedagogy" (implemented since 2008 at RTA and accredited in 2010, Nr.3465), which promoted education and regional development

policy, fostered development of intellectual potential of Latgale region, and enabled the introduction of e-services for educational access in remote format recently imposed by the conditions of COVID-19. The given project appeared to be a good basis of research to prepare the now licenced and launched in 2021 new doctoral program in Education Sciences that is now common for four universities of Latvia.

Following the informative report of the Ministry of Education and Science "Proposals for the provision of conceptually new competence-based teacher education" (https://www.izm.gov.lv/images/izglitiba_visp/IZMinfozinoj_14112017_skolotaju_izglitiba.pdf) the new doctoral program follows the aim to improve the doctoral student's research and academic competence in Education Sciences, their capability for independent and innovative research, improvement and development of theory and pedagogical practice at various levels of education by independently developed, internationally approved, and publicly defended doctoral thesis, which contains the results of original scientific research and provides new knowledge in Education Sciences, as well as knowledge transfer from theory to practice and to the related areas. The impact and scientific significance of the results are related to the substantiation of the research and the Latvian legislative guidelines on the need to implement a consolidated doctoral program in pedagogy in Latvia in a remote format, the development of scientific competencies and university capacity.

DocTDLL and the new doctoral program in Education Sciences partly coincided with the participation of RTA researchers in the adopted by the Latvian government (The Cabinet of Ministers No. 278, 20.05.2020) National Research Program for Mitigation of Covid-19, the outcomes of which could mutually support each of these activities. Thus, the scientific excellence and novelty of these projects were determined by the researchers' synergetic orientation towards the creation of new knowledge and methodologies for learning and doing with digital technologies, as well as development of guidelines and recommendations for policy makers at the regional, institutional, and national levels in the global context. Evaluating the normative documents and methodological issues through retrospective lens, it can be concluded that DocTDLL has contributed to digitization of education by moving the focus from technological and environmental infrastructural changes to the improvement of human capability.

1.2. IRĒNA ŽOGLA

Education is not the Earliest Adopter of Digital Technology

It is not hard to learn more. What is hard,
is to unlearn when you discover yourself wrong. Martin H. Fischer

The research problem of the project from which this book arose originated in an encounter between its three researchers Todd Blayone, Olena Mykhailenko-Blayone, and Irēna Žogla when one day several years ago an e-mail arrived from Todd suggesting to think of possible cooperation. A Skype discussion turned into a valuable opinion exchange; the core problem for the next project was touched upon. This was the digital transformative learning of doctoral students. By that time, Rezekne Technological academy had significant experience with projects including the State research program that had been finished by the Institute of regional studies (REGI), which was working on the new doctoral program. By the time that the project applications had to be submitted, the research group was ready to start.

The relevance of the research is obvious; technology's exponential growth is rapidly compounding the problems for education via digitalisation and automation. Both of these produce societal disruptions especially in the mode of sudden online formal education that makes educators and learners experience uncertainty and volatility. As usual, education demonstrates a certain lagging behind the trajectory because digital technologies are being developed according to other needs rather than educational ones. More crucially than ever, educators at universities like all humans are searching for stability and a sustainable future. During times like these, with the impact of rapid changes, uncertainty, and the lack of stability in many areas, teachers and educators expect assistance from government bodies, as well as researchers and doctoral students – from the wisdom of educators to meet their hopes for support during these changing times.

With the belief that neither the speed nor the scope of digital transition will slow down, at least in the nearest future, the project group started investigating the digital skills of educators and doctoral students, their attitude to digitalisation in education, and to develop a way of learning online. Soon this process got severely impacted by Covid-19 when the slowly evolving pedagogical provision for online learning was interrupted by a sudden jump to a completely online process. In the couple of years before the pandemic, several projects had been launched and multiple publications had appeared which presented a theoretical focus for, and practical implementations of, digital technologies in education. All this, together with the DocTD and other more recent projects, highlighted essential gaps between theory and practice, research and implementation, as well as provided good documentation based on experience. This collection of reviewed articles along with the case studies at several universities

provides theoretical inferences that might help educators and doctoral students close the most crucial gaps.

In some ways, a fully online mode of study even for the doctoral curriculum was unexpected. The preparation of a new doctoral program for certification was started, and the importance of digital technologies in these processes was clearly articulated. Educators had not even thought about a package of computerised materials for a fully online study mode. They were used to working with some fractionated materials and slowly continuing to improve these. Nevertheless, renewed and newly developed study courses expected support with guidelines, worksheets, other didactic materials to be prepared before the online discussion. Highly digital transformative learning seemed a new term and educators, as well as students, lacked the knowledge and skills needed to the changing mode of teaching-learning and conducting a totally online course, especially when many companies had switched over to working online and the whole family did their work online resisting an unprecedented regime, sharing access to computers under emotional stress.

Digital technologies have become pervasive in almost all areas of human lives and the notion of their integration into education has become inappropriate. Categorisation is a recurrent problem in education, with it now being more accurate to consider the pedagogy of transformation, which includes digital technologies that function as a pedagogical tool in the formal education environment. To promote digital technology and computational thinking as a means of generating knowledge through digital tools, consideration needs to be given to transformational pedagogy and how that becomes a foundation for the meaningful learning, knowledge and wisdom, and how monitoring of the global goals interacts with other parts of the system and may have unintended effects on teaching and learning.

Identifying pre-conditions, the authors have already addressed a number of important issues related to digital pedagogy and introduce their views for the doctoral students' consideration. For instance, M. Schweissfurt (2014) argued for a revised conception of student-centred pedagogy; H. Beetham & R. Sharpe (2013), and D. Laurillard suggested to rethink pedagogy for a digital age; A. W. Bates, (2019) drew on teaching in the digital age; A. Paniagua and D. Istance reminded that

> *"... using technology well for pedagogical purposes is no easy task. ICT itself does not enhance learning nor does the sophistication of the technology applied. One of the pitfalls of ICT integration is when teachers adopt traditional pedagogical strategies. Another risk is that teachers become more concerned about how they use ICT, than about the benefits of technology for their students."* (2018, 26).

Still important problems remain less attended.

> *"The continual challenge from digital technologies has forced education into the position of following rather than leading innovation, and the academic teaching community needs to gain better control of our use of technology (Laurillard, 2013, p. 8).*

Different notions are being used when mentioning the same phenomena. For instance, we use the term 'digital technologies' instead of the more popular term 'computer technologies' to cover the wide range of new digital tools.

The core idea of the DocTDLL project was to draw the attention of educators and doctoral students to changes in doctoral studies, potential problems and new knowledge triggered by the advent of digital technologies that have totally transformed educational settings, teaching/ assisting, doctoral students' academic studies and research. A comparatively small project cannot solve all problems, as well as investigate the issues in depth and describe the findings in detail. Therefore, this group of researchers took into account that doctoral students and educators are already highly educated people, so the researchers did not adhere strictly to the requirement to develop a systematic theory and present tedious questions about practice. Researchers have framed the possible outcome by solving at least some of the problems for doctoral research and proposing fresh ideas with a new focus on digital learning. The authors will seldom introduce definitions (some of which might be found in the project's publications). They are presented mainly as an introduction and have a triggering function, as doctoral students have to develop ideas and definitions based on their research, thus demonstrating their contribution to the theory and practice in this field.

Some pointers, which will appear in more detail throughout sections of this book:

Firstly, the two intellectual traditions distinguish between the continental understanding of pedagogy and more popular in English-speaking countries, Education Sciences (with pedagogy as one of them, mainly reduced to teaching). Latvia has developed research and practice of pedagogy based on the understanding that formal education programs include a big component of new knowledge, skills, attitudes, and other individual qualities the acquisition of which is time-consuming and students need the assistance of educators. The latter takes place in accordance with the basic laws of pedagogy, which remain stable and only change the content according to the level of education or details, so that they correspond to the particularities of the course of study.

Meanwhile, there are researchers in the UK, like professors Nigel Tubbs (1996) and Diana Laurillard (2013, 2018) who perceive pedagogy in a much wider sense and did not frame it only as a method. On the contrary, pedagogy is first and foremost about judging which methods, if used comprehensively, will most effectively achieve the

goal. Therefore, educators like teachers need complex and deep knowledge, which underpin their academic and professional competence.

To cope with the growing complexity of the learning and research environment, doctoral students need the help of educators in academic studies and research, which are now impacted upon by the speed and scale of digital transformation. This is a time of complexity, when not only doctoral students but also knowledgeable educators and researchers need discussion to "squeeze in the achievements" in the allocated timeframe of the program. This calls for re-thinking pedagogy (Paniagua & Istance, 2018; Laurillard, 2013; Beetham & Sharpe, 2013).

Secondly, to start with pedagogy, we need to clarify two concepts. 'Digital teaching-learning' is one in which digital devices are used as pedagogical or teaching aids, according to the needs of the respective programs. "Digital transformative learning" is one that uses digital tools and therefore changes the learning and pedagogical process to acquire knowledge, skills and individual characteristics, such as attitudes, value systems, moral qualities, etc. Digital technologies are transforming the pedagogical process – all its components, as well as their internal and external connectivity, therefore, it has a specific research object and results are evaluated according to their specific criteria; doctoral students are encouraged to define research-based specific criteria and evidences in practice – whether and how the help of educators initiates and supports students' learning, and therefore both have better achievements.

The education sector is not the earliest adopter of new technology. Even if educators and learners are well-equipped, they often meet usage-based problems related to understanding the learner's needs and appropriate usage of educators' skills to facilitate problem-solving, knowledge-generation, creative thinking, etc. Additional problems appear when students' digital skills are not linked either with theories or practice to the study programs. For these reasons, digital transformations in education move slightly slower than in many industries and in digital technology production. Until recently, progress toward this kind of transformation in the education sector was lagging behind (Impact, 2020; Bates, 2019; Newman, 2018; Powley, 2018; Beetham & Sharpe, 2013).

This means that not all pedagogical skills can be taught in the traditional way; some can form the basis of practice, while the most effective assistance can be provided if educator practice is based on their pedagogical philosophy, knowledgeability, and mindfulness. The synthesis of these qualities in a changeable environment appears as the wisdom of the educator and teacher. The complexity of the social environment suggests tackling The Complexity Theory and pedagogy as a complex theory and practice of formal education, that now should be informed by neurosciences and adjusted for learning and teaching in the digital age (Levin & Lundi, 2016).

Thirdly, to be a transformative learner and/or educator means to have the knowledge and skills of taking full advantage of a technology-rich learning environment, as well as to be aware of the possible harm if technologies are inappropriately used when answering the main pedagogical questions of 'what' with technologies, 'why' with technologies, and 'how' to use technologies in teaching-learning and assessment at a given level of education, as well as how educators and students get to know if they have done and achieved what and how they wanted to achieve. The latter becomes a matter of a special mindfulness when the whole process is online. Technologies as education/pedagogical tools must be defined and described in their pedagogical capacity, prove and demonstrate why learning and teaching with digital technologies is better than learning without technologies, put into a pedagogical system instead of submitting the pedagogical process to technologies.

> *"The sciences of pedagogy are moving the education profession away from a concern for the transfer of the capacity to appreciate and understand the knowledge and to utilize skills, toward concern for the involvement of learners in the creation of their own knowledge and understanding" (Gordon Commission, 2011, 3).*

Fourthly, digital transformations of learning, assisting learning, and environmental change places new demands on educators who have to work in a new environment; their role has been transformed, and the changed dominating way of assisting with learning teaches them to become digital learners, share activities with their students and work together to generate new knowledge and skills. Students and educators know the possible priorities of digital technologies, for instance, to complete operations on behalf of people, thus saving educators time and energy. But underdeveloped skills and inadequate equipment, as well as a poorly organised environment, usually make the work of educators complicated and time-consuming. Relationship development systems are of special concern along with "mutually influential relations between individuals and contexts" (Lerner & Callina, 2013).

Fifthly, the concepts of 'skills' and 'competences', 'transversal' and 'digital' skills in publications of the last two decades are used inconsistently and interchangeably. In doctoral research and publications these should be described or even re-defined according to transformations in the environment that affects skills. For example, A. Rospigliosi & T. Bourner (2019) have explored the substance of research and digital competences in the 'transversal' category, as well as integrated these into the context of the aims of higher education appropriate for a knowledge-based society. There could be more notions on the importance of transversal skills or competencies. The adoption of the competence approach by the EU member states has contributed to equalising education with a great variety of teaching and learning approaches.

Concerning digital competence, several frameworks define a specific 'digital competence' with some variation in the terminology used (digital competence, ICT competence, digital literacy, digital citizenship, and digital creativity). ‘Transversal skills’ (Economou, 2016) or …” ‘transversal elements’, such as ‘critical and creative thinking’ are the most pervasive of these (Council of the European Union, 2018, 10-11). The Working Document provides information on the seven best known international competence frameworks (ibid., pp. 19-20); each of the frameworks has a dominant idea. Nevertheless, the terms 'key competencies', 'transformative competences', and 'transversal competences' have overlapping elements.

Researchers, by summarising exemplar models of expertise, have revealed the changing relationship between general, transferable skills and specialist knowledge. They state that the evident decline in specialisation raises a number of issues for doctoral studies, as it is increasingly called upon to serve many and potentially contradictory needs, such as the innovation society on the one hand and the specific discipline on the other. Reducing the tension between depth and breadth is also an important issue for a degree that is based on an in-depth investigation (Barnacle, et al, 2019).

Recent studies from different fields allow for predicting the growing role of ‘generic skills’ in the future working world (e.g., Blayone, et al, 2020; Virtanen & Tynjälä, 2018; Forbes 2013). Generic skills develop together with certain kinds of pedagogical strategies, such as group activities and collaboration, participation in discussions, and partnership in projects. These will include social, organising, learning, problem-solving skills, etc.

> *“Pedagogical practices nurturing the learning of generic skills in higher education: the graduates found that situations that demanded collaboration, participation, involvement, and interaction allowed them to most develop their generic skills” (Virtanen & Tynjälä, 2018, 881-2).*

Sixthly, there will be no progress without appropriate non-stop or life-long learning of educators to constantly improve their academic and professional qualities (be these addressed as competences or skills). The European Commission revealed concerns about the mismatch between, what higher education institutions are currently delivering and the skills graduates need to succeed. The EC by its multiple publications pays attention to the quality of teaching as a key factor to improve quality in higher education; it also accentuates a need for greater efforts to invest in the pedagogical further education of academic staff.

The DocTDL project began with educators’ and doctoral students’ interviews. The semi-structured but wide-ranging interviews and questionnaires covered such items as: educators’ knowledge of digital technologies, digital skills, attitudes to digital

technologies; culture-related qualities of digital skills; educators' motivation to improve their digital capability. The interviews revealed a shift of focus in the understanding of doctoral academic studies and research, doctoral students' learning and concept creation, a shift in pedagogical provision, and accents in university as a learning environment.

The project launched a number of changes to the doctoral program in education to enable educators to provide the necessary support in the digital learning environment using digital technologies. The shift in emphasis in the digital teaching-learning process was implemented through a program of further digital learning where the educators and doctoral students themselves became learners and the pedagogical process acquired the characteristics of a partnership. The implementation of the new doctoral program is an appropriate field for research.

The validation took place in 2019, after that the program was improved and another round of online classes were conducted in 2020. The feedback from educators and doctoral students was analysed and compared with the data collected through interviews. Most of the empirical data have been published in the researchers' articles and these are not repeated here. Instead, broader theoretical considerations have been provided. The theoretical and empirical data analysis allowed the researchers to focus on some of the issues addressed in this final publication. The theoretical analysis covers part of the research, adds to the analysis of empirical data, and has identified several shifts of focus in the doctoral studies:

Theoretical and empirical data analysis allowed the researchers.

- in the academic part of the program, shifting the focus from the receptive role of the doctoral students to active research, inquiry-based academic learning integrated with the doctoral research to complete the dissertation by using the priorities of the digital environment and its tools;
- doctoral research is a part of the university's research program, coordinated and managed by the academic unit of the university or the doctoral council in the context that provides a higher level of implementation in practice by ensuring close links and cooperation in research teams. In order to improve practice, the emphasis of doctoral activities should be on obtaining a degree with a focus on the theoretical and practical validity of research and implementation.
- students' autonomous learning develops when evaluation is integrated into the education process, when evaluation starts, accompanies, and finishes a learning cycle instead of the accent being on evaluating mainly the final outputs. Self-evaluation leads to learners' achievements that include not only the academic results but, first of all, self-assessment and evaluation of the researcher-in-making when learning through investigation and investigation-by-learning takes place in educator and doctoral students' teams.

This collection isn't really about educators, although educators, alongside the doctoral students, become the target group since both are expected to maintain partnerships in team-work-based inquiry learning integrated with research. It is about scientific advisers' assisting their students to develop the knowledge and skills they will need to obtain a doctorate in a digital age; not so much digital skills as a goal, but a way of thinking, rethinking and mindset that synthesises knowledge, skills and attitudes to produce individual and team achievements as successes in transformed formal education. For this to happen, though, doctoral students need the assistance of educators to be able to maintain the wisdom of educators benefiting from supported autonomy in digitalised and rapidly changing world.

Section 2 of this book – introduces The Activity Theory as a possible background for action research. This follows from the consideration that education in general and pedagogical process consisting of learning and teaching in particular are specific activities that, nevertheless, comply with the basic laws of human activity. Section 3 provides some accounts detailing how universities are transforming education that is affected by digitalisation. Section 4 suggests several theoretical considerations prompted by the DocTDL project, which are represented in more detail in the publications of this project (see the list of publications at the end of this collection).

Methodologically, to make sense of the various applications and developments in the evolution of learning with digital technologies, the DocTDL research adopted several theoretical approaches (these are introduced by the chapters of this book, presented in publications, and do not restrict the doctoral student's choice):

1. *The Activity Theory* as a framework for the analysis of teaching and learning appropriate for and contextualized with digital transformations.
2. The project addresses *The New Learning Theory* with a deeper understanding of the essence of human learning including brain functioning, its activity, and plasticity, individual features of learning, the role of prior knowledge, social learning situation, cooperation, and partnership, etc. at the core that is demanding towards new modes of teaching/assisting learning, as well as changing the generalized and vague 'the new' for the term that represents the essence of the current learning theory, preferably *'The Partnership Learning Theory'* or '*The Partnership Pedagogy'* since educators become learners and doctoral students demonstrate well-developed digital skills, make the role-exchange possible, and open a new area of educators' and doctoral students' considerations.
3. *Constructivist approach* being appropriate for self-directed learning and facilitating teaching with digital technologies.
4. *Partnership Pedagogy* that supports stronger connectivity, dialogue among participants, cooperation in knowledge creation, and development of critical

thinking – a pedagogical provision based on the developed understanding of learning.

5. Theoretical underpinning of *research methodology* and tools of investigation adequate for the inquiry-based educational process, as well as creating and maintaining partnership pedagogy appropriate for doctoral level.
6. Several theoretical considerations are touched upon that might help doctoral students and educators clarify the complex pedagogical process being in transition and responding to external pressures with the well-constructed pedagogical process for the benefit of students; thus, it makes educators and researchers address *The Complexity Theory*, the importance of *deep learning*, some tenets to create an appropriate background of partnership pedagogy and *educators' wisdom* to navigate in the rapidly changing environment, as well as the structure of pedagogical process with digital technology as a pedagogical tool.

***Notes**:*

1. *Readers will notice that citations are more often incorrectly formatted because pages are not specified; it is intended to encourage doctoral students to read the whole work and to identify the author's ideas in contexts.*
2. *Readers will also notice that there are few definitions in the articles; it is also intended for doctoral students to study pedagogical phenomena in the context of digital learning and to offer original, research-based definitions.*
3. *The researchers of a limited in scope and time project are not able to cover all emerging problems and provide a well-structured pedagogical response to these challenges. They tried their best to identify ideas published by other researchers and to connect them with the needs of Latvian doctoral students.*
4. *The book is in English because Kyiv National University of Economics, Ukraine, has contributed to the research.*

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1.3. SVETLANA UŠČA

Introductory Remarks on the Improvement of Doctoral Students' Research

Doctoral research usually is a complicated and time-consuming activity of particular concern. The DocTDL project has highlighted some topical items that call for the more precise attention of doctoral students and their scientific advisers, especially when the social and technological environment changes rapidly and forces researchers to take into account the complexity of the education process.

There must be a link between theory and practice in educational research, but the analysis of doctoral theses shows that this link is often not clear (Corbin& Strauss, 2014; Goff, & Getenet, 2017). This tendency was noticed during the DocTDL project; therefore, within the framework of the doctoral program in education it is worth recalling the most important emphases of educational/pedagogical research. The program has been worked out as a joint venture of four Latvian universities and needs coordination of its implementation between universities, as well as joint doctoral research. Especially important is the doctoral students' understanding about the concept of joint research that becomes an important condition for the quality of doctoral research (the program "Education Sciences" is licenced in 2020. https://www.lu.lv/studijas/fakultates/pedagogijas-psihologijas-un-makslas-fakultate/doktorantura/izglitibas-zinatnes/).

Educational research has rich traditions, so a design-based research methodology has evolved in the 21st century that fosters this link (Anderson & Shattuck, 2012), and the digital transformation of education and science, which is also creating new demands. In the era of digital transformation of education, doctoral research is of an increasingly complex nature and, in parallel with the two main tasks of research to improve theory and to offer a practical solution, experienced researchers and doctoral students have to pay attention to the correct use of digital technologies in data collection and storing, comparative analysis, and adaptation to specific cultural environments. As a result, the confines of the doctoral student's research competence need to be expanded. Skills such as the development of research design, networking and up-to-date data acquisition, storage and processing technologies, alongside with ensuring accessibility in accordance with the requirements of open science have become important components.

This chapter draws the doctoral students' attention to the most topical issues of educational/pedagogical research and calls for a deeper analysis of the literature and other recent issues mentioned in this section, which reflect the complex nature of pedagogical research in a changing social, digitally saturated environment.

1.3.1. Research Design

In Latvia, following the historically developed pedagogical philosophy and the traditions of the development of pedagogical science as the theory and practice of obtaining education at institutions, pedagogical/educational research mostly takes the form of action research. Based on the findings of various authors (Ballantyne, 2004; Coughlan & Coghlan, 2002; Erro-Garcés & Alfaro-Tanco, 2020; Mejia-Villa & Alfaro-Tanco, 2017), the main features of action research are summarised (Table 1).

Table 1.1 *Features of action research*

Feature	Description
Dual contribution	A set of integrated research based on dual contribution - theoretical and practical
Interaction between researchers and practitioners	A researcher acts both as an agent of change and a practitioner, who participates in all stages of the process actively
Data acquisition	It includes all types of data collection methods, so it is necessary to obtain information from several sources. Triangulation of data acquisition methods ensures the reliability of research.
Cyclicality	Action research methodology can be analysed as a cycle where new action research studies can be further developed. Therefore, it is important to publish the primary data in

Any modern pedagogical/educational research should be considered as interdisciplinary, in various aspects, emphasising the complex nature of the phenomenon under study. A system in education/pedagogy contains many interacting elements that form subsystems by themselves. Such systems characterise progress of the research field in its complexity - the system is growing and becoming more complex (Pipere, 2016). According to Complexity Theory, pedagogical/educational research demonstrates several features:

- focuses on change, interaction, diversity and evolution;
- examines complex systems (most often teaching, learning, competences, etc.) that consist of interdependent components that interact with each other and the environment in which the individuals involved learn from each other, adapt behaviour accordingly, and are related to common needs and goals;
- is a set of theories for the research of dynamic properties and behaviour (Turner & Baker, 2019).

It is clear that such a view of research also requires a complex process of data collection and analysis with a well-prepared research design, when all the elements of

the structure of the studied phenomenon are precisely substantiated. The connection between the theory and the understanding of what criteria and their indicators help to determine the quality/level of the phenomenon under study/development is important. This will allow for the creation of a good research design and the choice of appropriate data acquisition and analysis methods. If there is no clarity about the phenomenon under study, its constituent elements, evaluation criteria, indicators, and justification for how to measure it, even a theoretically good research design will not help.

Currently, the emphasis in doctoral research is put on the design-based research methodology. Kennedy-Clark (2013) believes that the design-based research methodology provides a platform for higher-level research, allows for using a range of data acquisition, methods of analysis, and allows a doctoral student to achieve deeper understanding of the research phenomenon and to provide answers to research questions. Digitalisation and open science principles, in turn, provide doctoral students with opportunities for international cooperation, as well as storage and availability of data in repositories, thus ensuring succession, comparing new data with data obtained in other research and increasing data validity, as their availability allows for verifying the consistency of analytical methods.

Figure 1.1 *Three-stage design-based research model amended for educational / pedagogical research (after Abdallah and Wegerif, 2014; Goff, & Getenet, 2017)*

The literature (Abdallah & Wegerif, 2014; Goff, & Getenet, 2017) discusses a three-stage design-based research model, emphasising that the particular context, nature, and objectives of individual research inquiries are unique (Figure 1). Doctoral students like any other researcher construct the theoretical basis of their investigation, using the findings and developments of several researchers. However, the authors may have formulated their contribution as general findings or as tailored and valid for the specific use of their particular research. Therefore, the doctoral student has to create the theoretical background of his/her particular research, specifying and thus constructing valid and reliable theoretical approaches, concepts, regularities, methods accordingly. Moving through stages improves and reflects the doctoral student's understanding of the problem and, therefore, is important for completing valuable research.

Such a model is in line with the requirements of Latvian higher education institutions for doctoral research in pedagogy/educational sciences – a publicly defended doctoral theses, which contains the results of original scientific research and provides new findings in the relevant branch or sub-branch of science (Cabinet of Ministers, Regulations Nr. 1001, 2005, item II-2). However, the digital transformation, as well as the findings of neuroscience and New Learning Science, continue placing new emphases for pedagogical/educational research. It requires a doctoral student to have specific skills in order to use the design-based research methodology and apply these to complex pedagogical / educational phenomena. Leshchenko et al. (2021, 4) emphasise that safe application skills of digital technologies in searching, storing, and analysing data include the ability to use digital technologies for research planning, statistical data processing and presentation of findings, searching information in open digital scientific and educational systems, the ability to select optimal digital technologies at each stage of scientific research, the ability to search for like-minded people on scientific ideas, innovations and their implementation etc. These prove the high research competence of a doctoral student. An appropriate opportunity to develop these skills and researcher qualities for the doctoral students of education/pedagogy is provided by a study course in the doctoral program common to four Latvian universities on research methodology followed by specific modules provided by each university.

The chosen research design and well-created methodology is a fundamental tool for new knowledge acquisition (Queirós, Faria, & Almeida, 2017). The selection of appropriate research methods and techniques for the research process is becoming a challenge for researchers (Dzwigol, 2020). Depending on the chosen methods, the doctoral students may choose quantitative, qualitative, or mixed research design – the latter being the most popular with the choice being determined by the aim of research, tasks, and research questions appropriate for the changing educational environment.

A precisely chosen method is an important tool for exploring new theories and testing their operation empirically in a specific context (Flanagan, 2013).

A researcher is responsible for not only simply choosing the most appropriate research methodology according to the context of the phenomenon under study; he/she has to contextualise it and make it relevant for a pedagogical / educational study. This means that, for instance, a questionnaire that is a borrowed from sociology should follow the logic and data analyses according to pedagogical / educational criteria avoiding analysis according to sociological criteria and, consequently, arriving at conclusions of a sociological character. Therefore, the criteria are based on the pedagogical / educational theory, but their evidence and facts are provided by the particular practices under study.

When choosing the method, one should take into account the advantages and disadvantages of each method and the specifics of the particular research (Queirós, Faria, &Almeida, 2017). In addition, the methods must be such that the benefits to participants outweigh the risks associated with research, which are more often psychological in pedagogical research, therefore the conclusions are complicated and sometimes unclear for implementation. This is a common drawback, for example, when quality of life, social exclusion, developmental disorders, etc. are researched for educational purposes (Mihailovs, Sīle, & Sīlis, 2016). It would be wise for the doctoral student to compile a comparative table in order to weigh up possible benefits and losses, as well as pedagogical criteria used in the investigation and those belonging to other sciences. This also will help researchers to construct a unique methodology of qualitative, quantitative, or mixed design of the research.

Apuke (2017) distinguishes 16 criteria for comparing quantitative and qualitative methodologies, emphasising that the main goal of qualitative research is to understand and interpret social interactions (in our case – pedagogical interactions), while quantitative research allows testing hypotheses, analysing the correlation between causes and consequences, as well as modelling future developments of a pedagogical / educational process. To facilitate selection, Queirós, Faria, & Almeida (2017) offer 7 dimensions for comparing qualitative and quantitative research (Table 2).

In the mixed research design, both qualitative and quantitative research methods are used to investigate the phenomenon under study. It also provides triangulation options where data are obtained by different methods from different sources and allows for a more comprehensive understanding of the problem. The mixed research design is also used in cases when a deeper understanding of the problem is required before qualitative data can be obtained, or when quantitative results are difficult to interpret and qualitative data can help to understand the results.

Table 1.2 *Differences between quantitative and qualitative research methodologies (after Queirós, Faria, &Almeida, 2017)*

Dimension	Quantitative research	Qualitative research
Focusing on understanding the pedagogical / educational essence of the problem, social, and technological contexts of learning / educational environment	Smaller	Bigger
Cooperation, team, group activities, partnership in learning and synergy	Smaller	Bigger
Proximity of the researcher to the problem being studied	Smaller	Bigger
Scope of the study in time dimension, its coherence with the time-line of the pedagogical process	Immediate	Longer range
Researcher's leading educational / pedagogical philosophy in brief	External	Internal
Theoretical framework and hypothesis or research questions (it would be beneficiary if the researcher makes a table of theoretical statements borrowed from other sciences for a pedagogical / educational research to conclude if the pedagogical / educational context of these is clear	Well structured	Less structured
Flexibility and exploratory analysis according to pedagogical / educational criteria	Lower	Higher

Mixed research design is appropriate for the cultural environment of Latvia also because the number of respondents for obtaining quantitative data is often relatively small for the sample to be representative, but a researcher may have difficulty avoiding subjectivism by focusing only on qualitative data. This is especially true for doctoral students, as their experience as researchers is still relatively small. This approach is also exemplified by, for example, the analysis of 6 doctoral theses defended at the University of Latvia in 2019-2020 where mixed research design was applied in 5 of them.

1.3.2. Transformation of Research in the Digital Context

The digital transformation of education also places new demands on doctoral research in pedagogy/educational science. At present, it is no longer enough to have well-designed research and collect primary data that is usually done by a doctoral student according to the research aim and objectives. Secondary (obtained by other researchers) and tertiary (aggregated) data are needed, and their analysis and selection require profound evaluation. The social and technological world is changing rapidly,

we are talking about the digital generation and changes in information processing, re-defining thinking and its development in the learning process at all levels of education, because the new generation is accustomed to instantaneous hypertext, through networking different internet sites simultaneously – thus using parallel processing and multi-tasking, graphics are often more important to them than text, and reading is therefore not that important (Berikol & Killi, 2021; Iivari (Lana, ja pareizi atceros, tas ir Ivary – lūdzu, pārbaudi, Sharma, & Ventä-Olkkonen, 2020; Venter, 2017). In times of rapid change, it is not enough to analyse information from published foreign experience, because time from data acquisition to publication has elapsed. It is useful to use networking to obtain the latest information that allows a doctoral student to discuss, get the latest data, and collaborate with researchers who solve similar problems, therefore, making the inventory process shorter or allow for closing the gap between discovery and implementation. It is necessary to use networking on academic social networking sites for carrying out research. Academic social networking sites have become a common venue for disseminating and accessing academic information (Yan & Zhang, 2018). Networking ensures: 1) cooperation that is essential for the generation of scientific discoveries; 2) interdisciplinarity; 3) increasing scientific specialisation; 4) following innovations in the world, thus promoting the creation of new knowledge and the opportunity to offer innovative solutions to problems (Soeldner, 2021).

Doctoral students are invited to join the international researcher communities through many academic social networking sites that will add to the quality and validity of their research and allow for more quickly approaching the level of an expert. Among the most popular are ResearchGate and Academia (www.academis.edu) that currently bring together millions of researchers from around the world, provide the easiest way to share papers with millions of people across the world for free, and include a platform for researchers to share, discover and discuss research online (ResearchGate, 2021). This opens the door to performing comparative research, as similar problems exist and are being addressed in other countries, although each country has its own specific characteristics that determine the cultural environment. The identification of similar and specific features only increases the significance of research. Academic social networking sites provide an opportunity to discuss the relevance of the research design to the research problem, data acquisition and analysis methods, and interpretation of results. Exchange of opinions and discussions reduce the subjectivity of research, while the possibility to obtain and analyse data from other countries helps to generalise and create new theoretical insights.

The data obtained from any research are, to some extent, related to their interpretation according to a constantly changing context. In order for researchers, including doctoral students, to be able to evaluate the phenomenon under study more objectively in further doctoral research, as well as to perform analysis in accordance

with changes in society, it is necessary to ensure free access to the data obtained in doctoral research, in accordance with the principles of open science - FAIR (Findable, Accessible, Interoperable and Re-usable data) and open data sharing should become the default for the results of EU-funded scientific research (European Commission, 2019). The inclusion of data in repositories increases the doctoral student's responsibility for their validity, the conformity of the chosen methods of analysis, and the interpretation of the results. In addition, the publication of research in serious editions (Q1, Q2) often requires a reference to access to primary data already in the review process in order to verify the validity of data and the adequacy of the methods. Much attention is paid to the suitability of the methods. Internationally recognised programs for qualitative data analysis (e.g., AQUAD, NVivo, etc.) and quantitative data analysis (SPSS, R program, Python, etc.) are currently available.

In the era of digital transformation, doctoral research is subject to ever higher demands, the fulfilment of which requires close synergy between the local and global context, precisely identifying the common and specific problems, their investigation and inventory. This is ensured by the doctoral student's ability to create an appropriate research design, the ability to use digital resources for secondary and tertiary data acquisition, the use of modern technologies in data analysis and the provision of free access to primary data. This increases the doctoral student's responsibility for conducting research.

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SECTION 2. OLENA MYKHAILENKO-BLAYONE
Theorising Transformative Digital Learning Approach

2.1. Conceptual Apparatus

The unit of analysis selected to explore is the activity system, which can be traced through the empirical and philosophical investigations of Vygotsky (1978) and Leontiev (1977, 2005, 2006), who began their work in the 1920s, and Engeström (1987, 2000a, 2009b, 2015) from the 1980s. In more recent years, the activity-system, as an alternative apparatus to cognitivist frameworks, has been widely adopted for studying human-computer interaction and collaboration (Clemmensen, Kaptelinin, & Nardi, 2016; Kaptelinin, 2017; Kaptelinin & Nardi, 2012a; Kuuti, 1995), and technology-mediated learning (David H. Jonassen & Rohner-Murphy, 1999; Lim & Hang, 2003; Mwalongo, 2016; Yamagata-Lynch, 2010; Yamazumi, 2006). Although Vygotsky did not refer to activity theory specifically (Lektorsky, 2009), his linking of mental functioning to the social world through *mediation* provided the activity system with its conceptual core.

Vygotsky's ambitious program of re-envisioning psychology took root in the wake of the 1917 Revolution, the "consequence of extenuating conflicts during which the country experienced unsustainable conditions of inequality" (Sannino, Daniels, & Gutiérrez, 2009). Marx attracted Vygotsky by his concept of human praxis, that is, concrete historical activity that is a generator behind the phenomena of consciousness (Vygotsky, 1978, p. 54). (Kozulin, 1986, pp. 265-266)

Focused on this social-praxis perspective and unmoved by the empirical progress of behaviourism, Vygotsky insisted:

> *"...human behavior and mind must be considered in terms of purposive and culturally meaningful actions rather than as biological, adaptive reactions. Objects of human experience—and therefore objects in psychological experiments—are socially and culturally meaningful things and not just abstract stimuli." (Kozulin, 1986, p. 266)*

To lend empirical weight to logic, Vygotsky pursued a variety of controlled laboratory studies, primarily with young people, which demonstrated how the introduction of artifacts into cognitive activities transformed a stimulus-response process into a complex culturally-mediated act (Vygotsky, 1978, p. 40). The structure of a mediated act was modelled by Vygotsky as shown in Figure 2.1(A). The more common representation of this same act, adopted by activity theorists, is presented in Figure 2.1(B).

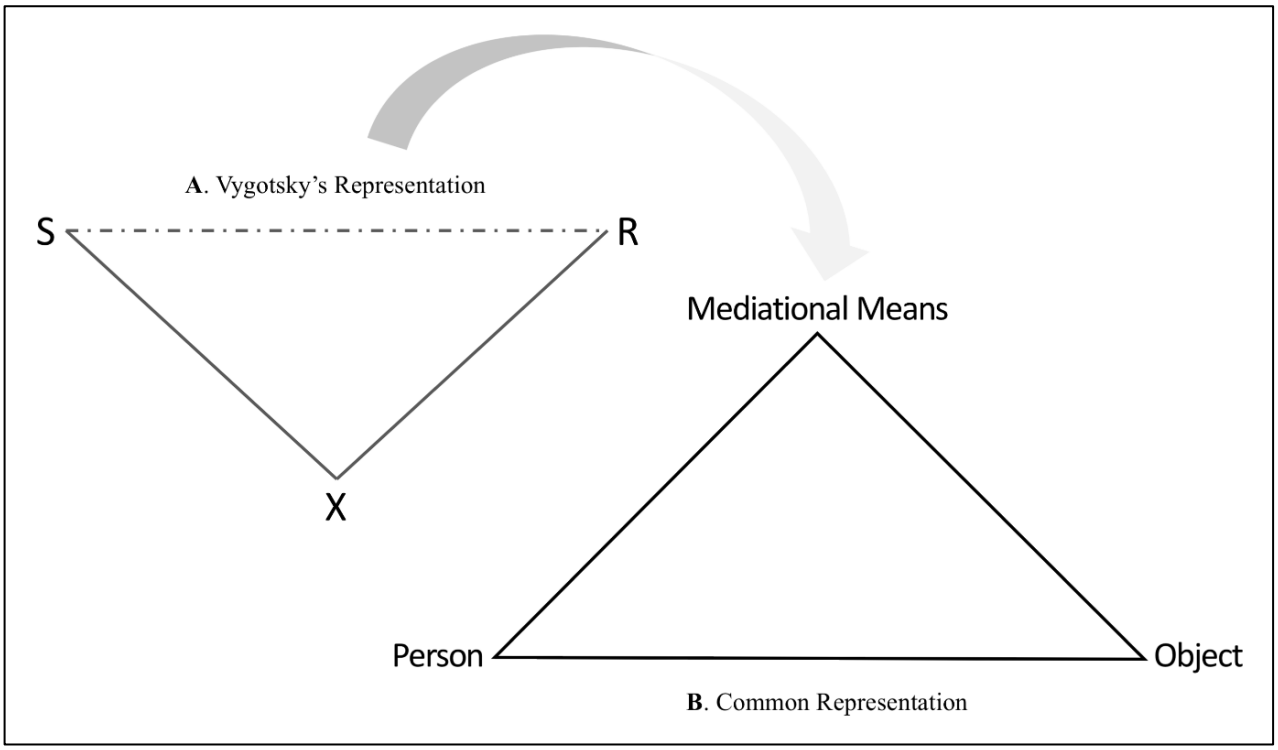

Figure 2.1 *Modelling the mediated act. Vygotsky's visual representation and a common representation*

Vygotsky's restructuring of psychological functions led him to theorize different types of mediating means. He distinguished between: (a) technical mediators (tools and instruments), which are intended primarily to help people affect external objects; and (b) psychological mediators—including physical artifacts (e.g., maps, diagrams and blueprints) and symbolic systems (e.g., languages, numeric systems and algebraic notations)—which primarily help people affect the minds and behaviours of themselves and others (Daniels, 2017). Because both technical and psychological mediators are cultural products, Vygotsky construed individual mental functioning as determined "from the outside," and formed fully through the gradual internalization of external processes (Kaptelinin & Nardi, 2012a). This served as a promising point of departure for Alexey Leontiev.[1]

Leontiev started his career as part of a research program initiated an coordinated by Vygotsky (Kaptelinin & Nardi, 2012b), but he later established his own agenda by placing greater focus on the role of practical activity (labour) in human functioning (Lektorsky, 2009). In effect, Leontiev "zoomed out" on the Vygotskian mediated act, shifting the context of study from laboratory studies to everyday, adult life. In the ebb and flow of productive labour, mediated acts functioned as constituent parts of social activity. In fact, activity could be positioned as the fuller mediational link between

[1] Leontiev's project must be distinguised from (a) Sergei Rubinstein's important related work, which flowed from a similar body of foundational theory, but presented a critique of Vygotskian "internalization" (Enerstvedt, 2014), and (b) another variant of activity theory formulated by G. P. Shchedrovitsky (Lektorsky, 2009).

subject and object, forming a "subject-activity-object pattern" (Leontiev, 1977). Positioned in this way, Leontiev pursued an "activity approach" to understanding the formation and structure of human consciousness.

Although extended discussion of Leontiev's activity apparatus goes well beyond our scope, four essential features of *activity* can be emphasized. First, the most basic feature of an activity is that it has an *object*.

> *"Activity may appear to be objectless, but scientific investigation of activity necessarily demands the discovery of its object. Moreover, the object of activity appears in two forms: first, in its independent existence, commanding the activity of the subject, and second, as the mental image of the object…" (Leontiev, 1977, p. 162).*

Leontiev's "object," which drives activity, and unites objective and subjective qualities within itself, has great appeal to many social-scientific researchers.

The second essential feature of an activity involves the use of *tools/instruments*. These mediational artifacts, both in physical and psychological forms, provided humans with tremendous power to achieve objectives. Leontiev extended Vygotsky's theorization of mediational artifacts in a least two directions. First, he gave significant weight to physical tools in the human history of concept formation. He suggested that a stone axe, for example, did not only serve a direct purpose of cutting trees or killing animals, but through use, it also functioned as a scale to differentiate between hard and soft objects (Kaptelinin & Nardi, 2012a). Over time, through shared experience, such distinctions would enter culture as generalizations. Second, Leontiev elaborated the concept of "functional organs" to speak about human-technology partnerships that extended or amplified human capabilities (Kaptelinin & Nardi, 2012a). Designing effective functional organs required humans to develop new sets of tool-related competencies.

The third essential feature is that activities are always products of a socio-cultural environment and carried out in relation to the activities of others. This remains true even when individuals work alone in isolation, because the tools and methods adopted are typically cultural products. Therefore, through activity, humans not only enter into a relationship with nature, but they also enter into a relationship with a *community*, which often engenders both coordinated action and purposeful communication.

Finally, from the earliest period of human history a technical *division of labour* and corresponding *rules* of conduct emerged to characterize activity and separate the goals of individual actors from the motives fuelling an activity system.

Division of labour was reinforced through the emergence of dedicated tool-making practices that separated the activity of tool specialists from that of hunters and gatherers. These sorts of specializations demanded greater formalization of

responsibilities, and more sophisticated codes of conduct (rules) emerged. Therefore, in the end, Leontiev theorized six essential elements of human activity: the *subject*, "*object," tools*, *community*, *rules*, and *division of labour*. With a view to relating activity to the formation of human consciousness, Leontiev also named the component processes of activity, and gave them a dynamic, hierarchical structure.

A diagram of this hierarchy is shown in Figure 2.2, which presents the hierarchically-ordered couplets—activity coupled with motive, actions with goals, and operations with conditions.

Although collective activity systems typically present existing conditions to which people are expected to adapt, individuals also discover/construct, within these social conditions, their *own* aims and motives. Therefore, although societies and cultures produce and shape activity, the agentic capacities of individuals to challenge and innovate is preserved. This is the individual-social dialectic within cultural-historical psychology, which permeates activity theory.

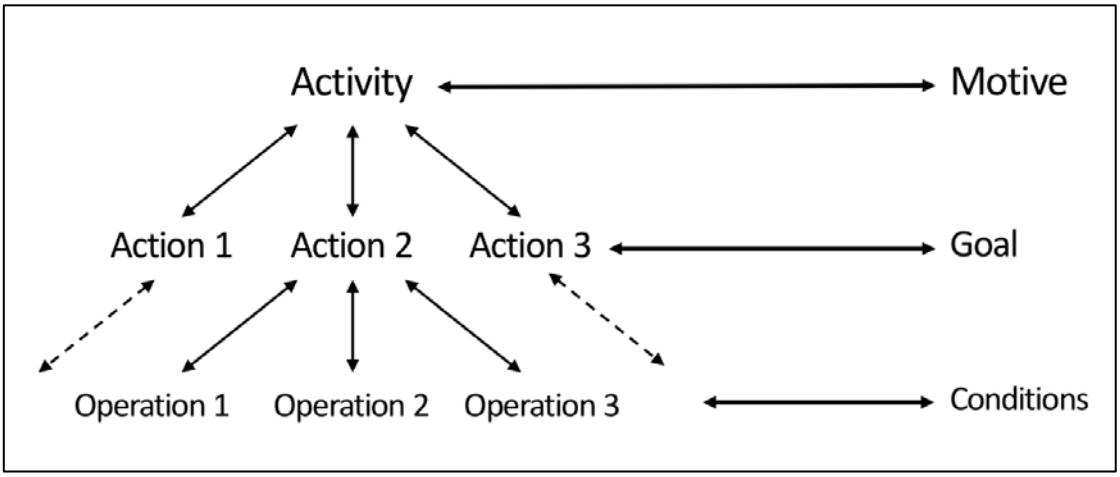

Figure 2.2 *Leontiev's hierarchical structure of activity, based on (Kaptelinin & Nardi, 2012a, p. 28)*

Engeström began developing a distinctive theoretical fork of activity theory over thirty years ago with an extensive secondary-research synthesis featuring the work of several Soviet psychologists little known among Western scholars at the time (Engeström, 1987). As a historical frame, for his approach, Engeström positioned Vygotsky ("first generation") and Leontiev ("second generation") as forbearers. Over the years, he presented the contexts of the Finnish professional-services organizations such as postal and health-care providers, and investment banks as activity systems (Engeström, 2000a; Engeström, Pasanen, Toiviainen, & Haavisto, 2006; Engeström, Virkkunen, Helle, Pihlaja, & Poikela, 1996) (Fig.2.3).

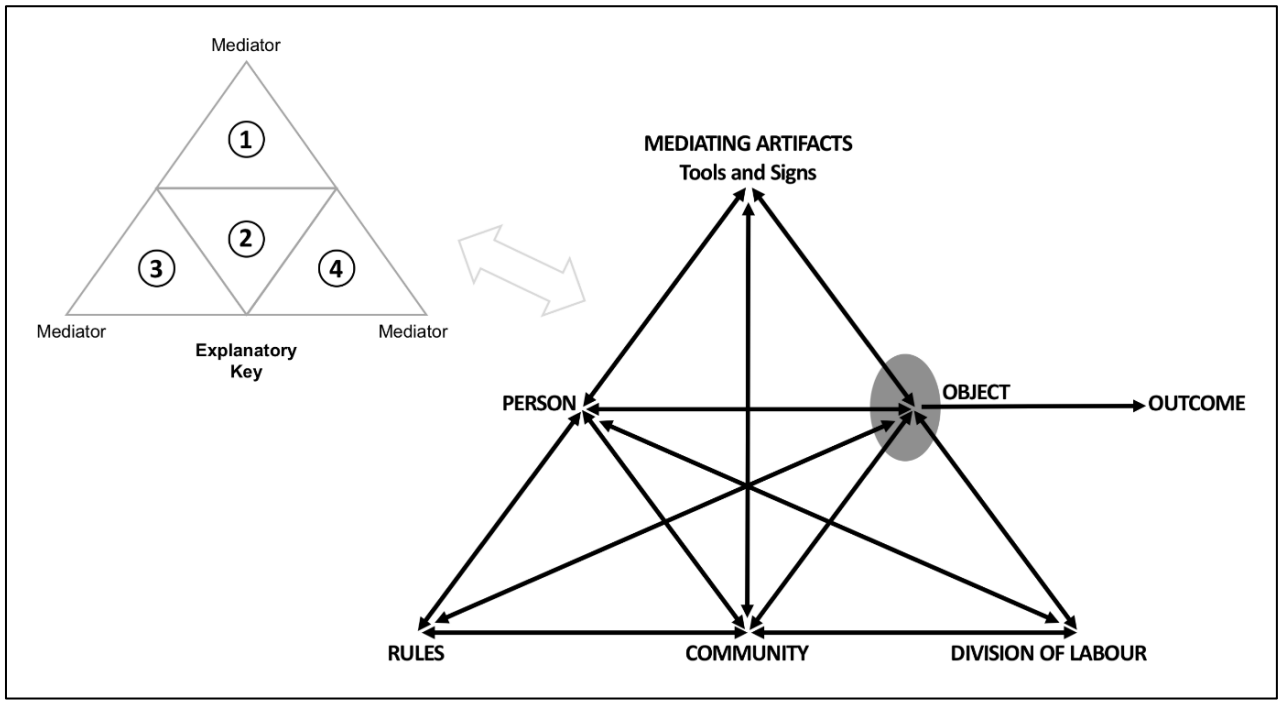

Figure 2.3 *An activity system as modelled by Engeström (right), with author's explanatory key (left)*

One of Engeström's most significant early contributions was diagramming an activity system, extending Vygotsky's individual-level mediated act to a collective activity perspective using Leontiev's illustrative examples.[2] This multi-triangle model, often drawn with arrows to emphasize the holistic, interconnected and elastic nature of activity, is shown in Figure 2.3 (on the right). The rationale for the structural design of this model may be summarized as follows. The activity system consists of four sub-triangles. Triangle 1 (as labelled in the Explanatory Key, Figure 2.3) is a representation of Vygotsky's tool-mediated interaction between a person and the environment, the core of activity at the individual level. Triangle 2, a vertical flip of Triangle 1, introduces the community, thus explicitly extending the model to collective activity. Triangle 3 introduces tacit or explicit "rules" (also, traditions, rituals, guiding values, etc.) as a mediator between the person and community of participants. Similarly, Triangle 4 introduces division of labour (social or organizational roles) as a mediator between the community and object. The object itself is depicted with an oval highlight, suggesting that "object-oriented actions are always, explicitly or implicitly, characterized by ambiguity, surprise, interpretation, sense making and potential for change" (Engeström, 2001, 134). Finally, an outcome is added as a result of activity, which could form the basis for a new activity (Fig.2.4).

[2] Engeström presents this visual as direct interpretation of Leontiev(Engeström, 2001). Kaptelinin, working within the domain of HCI, argues, under the heading "hierarchies versus triangles" that Engeström has misread Leontiev's illustrative stories, and that Leontiev himself did not explicitly address collective activities.

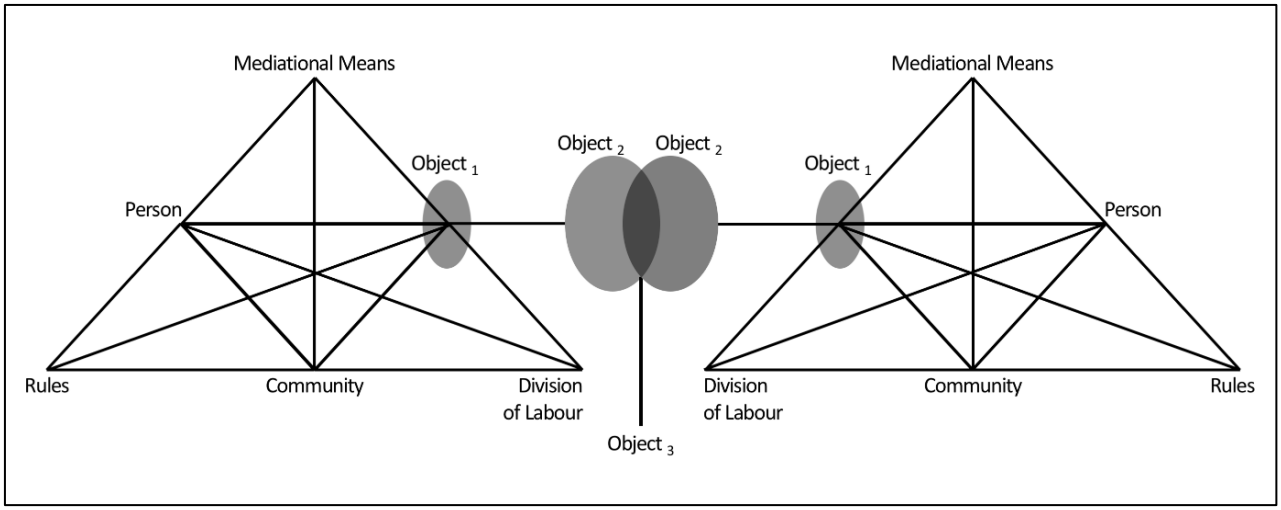

Figure 2.4 *Engeström's minimal model of "third-generation" (networked) activity theory*

An expanded alternative to this rendering, presented in some of Engeström's published work, overlays the foundational Marxian concepts of production (Triangle 1), consumption (Triangle 2) exchange (Triangle 3) and consumption (Triangle 4), integral to Soviet social science, to emphasize the idea of dialectical tension and inherent contradiction within activity systems (e.g., Engeström, 1987; Engeström, 2011). Subsequent activity-system (re)modelling has included multiple (sometimes hierarchically-arranged) activity systems, and large "runaway objects" (featuring problems like global warming, which are too big to be the sole property of any single system) (Engeström, 2009b).

Secondary models are often developed by researchers and participants in specific contexts of interventionist research, sometimes replacing "official" activity-system models as a basis for critical reflection and formulating transformation strategies (Engeström & Sannino, 2010).

2.2. Tensions and Transformations

Although "contradiction" plays an negative role in Aristotelian formal logic — as something to be rooted out — it plays a more ambivalent role in dialectical thinking — as something fundamentally systemic (Horn, 2014). Engeström (1987) also regards contradiction as an *inherent* by-product of political and economic systems in which individual and collective activity takes place.

Engeström (1987) identifies four levels of contradictions that emerge in activity systems. The first-level contradiction is that which exists between use value and exchange value. This contradiction is pervasive and manifests itself *within each corner* of the activity-system triangle. Second-level contradictions are those appearing *between the corners*. For example, the introduction of new tools or technologies into

an activity system may conflict with established roles (division of labour), or challenge (explicit or tacit) rules that were established in relation to the use of older technologies. Third-level contradictions appear as *object/motive-related tensions* between different groups of actors in a single activity system. For example, the driving motive of learners in an educational activity system may be at odds with a teacher's objectives. Finally, fourth-level contradictions are those appearing between the activity system selected as an object of study and a *neighbouring* activity system. Within activity-system modelling, second-level contradictions, which tend to dominate most analyses, are presented as arrowed bolts as shown in Figure 2.5.

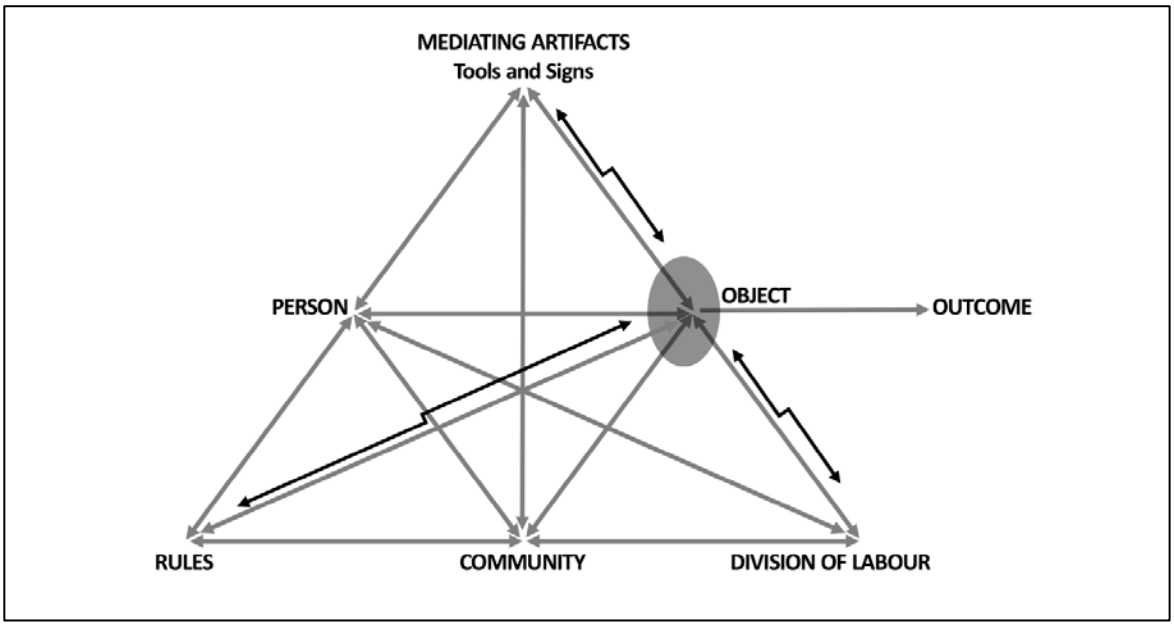

Figure 2.5 *Activity system model showing second-level contradictions*

Neighbouring systems might take on a variety of forms. For example, in educational contexts, they may: (a) emerge as an outcome of the focus activity system; (b) produce, supply and/or manage required tools and technologies; (c) provide education and training for members of the focus activity system; or (d) function as an organizational body that defines roles, and produces/maintains rules. In short, in contexts of intervention, the focus activity system will seldom exist in isolation, and several neighbouring systems may have considerable impact on the former. (This is the logic behind labelling Figure 2.4 a *minimal* model.) Of course, a manageable breadth of analysis must be established, and typically, participants in a change process are seldom drawn from more than a few systems.

Importantly, Engeström (2011) emphasizes the hopeful function of contradictions as catalysts for developing individual and collective agency, potentially leading to innovation and "breakthroughs" in activity systems from below. Moreover,

breakthroughs like contradictions, given enough time, are seen as an inevitable part of human activity.

Contradictions are opportunities for transformation only if participants possess or develop personal resources to express their *agency* (Bandura, 2006; Reeve & Tseng, 2011). This perspective departs from technologically deterministic approaches to digital transformation defended by some media-theorists (Rückriem, 2009).

The agency of individuals and collectives present a "layer of causality," (Engeström, 2011) for realizing transformative action. Engeström (2011) identifies three types of agentic acts that an interventionist researcher should expect to observe. The first involves a participant resisting the interventionist researcher, which may take the form of criticism, questioning, opposition, or rejection. This active resistance is never to be suppressed or dismissed because resistance is a vital force for system transformation. The second involves envisioning new possibilities for the activity, or new ways of modelling it. In the latter case, the activity-system model may be superseded by context-specific models. The third involves committing to concrete change, and taking consequential actions. To capture consequential actions—which often take place outside of change sessions—the researcher may have to pursue additional data collection well after the intervention process is completed.

Engeström does not place emphasis on human-technology partnering as a mean to instigate and amplify human agency. This is somewhat out of step with Leontiev who emphasized tools as powerful mediators of human agency, enabling subjects to refashion their perspectives, and enhance their capacity for transformation from the outside (Kaptelinin & Nardi, 2012a). In a digital world, to achieve the agentic potential of "functional organs," humans require "meta-functional" competencies in order to delegate tasks to a device and maintain *effective* human-computer partnerships (Kaptelinin & Nardi, 2012a). Engeström lays a solid foundation for recognizing agency as a vital layer of causality within Developmental Work Research (DWR) interventions.

The final component of Engeström's argumentative grammar introduces an expansive learning cycle as a heuristic conceptual device to model the logic of "ascending from the abstract to the concrete" (i.e., reasoning from seemingly disconnected parts to a systemic whole) and keep research interventions focused on object transformations.

The expansive-learning cycle begins with a process of *questioning*, criticizing, or rejecting aspects of established practice and conventional wisdom. With a desire for transformation established (Leontiev's "need state"), the second action involves modelling and *analysing* the relevant activity system both in its current form and as it has evolved over time, ideally, from its earliest recognizable form. The third action involves proposing, negotiating, and *modelling* a new activity system that addresses existing contradictions. The fourth action includes *examining* and reflecting critically

on the new model to anticipate its potential and limitations. DWR researchers have found it useful to instigate reflection by asking questions along four dimensions: (a) the social-spatial ("who else is to be included?"); (b) the anticipatory-temporal ("what previous and forthcoming steps should be considered?"); (c) the moral ideological ("who is responsible and who decides?"); and (d) the systemic-developmental ("how does this shape the future of the activity?") (Engeström, 2000b; Hasu, 2000). The fifth action is that of *implementing* the new activity-system model in practice through pilot applications or extensions to current practice. The final action encourages participating change agents to continue *improving* the new model in an effort to consolidate and expand the practice.

Given the openness of the DWR interventionist process and the emphasis placed on fostering the agency of participants, this ideal sequence is seldom realized fully in practice. However, "this dialectic between planned and actually realized courses of expansive learning is of great importance in future research". (Engeström & Sannino, 2010, p. 8).

2.3. Adapting Activity Theory

Adopting DWR as a meta-theoretical framework adds depth and transformative potential to our existing program of research. At the same time, this maneuver, which implies a melding of two research cultures, requires some critical interaction with, and adjustments to, DWR practices related to: (a) instrumentality and mediation, and (b) the instigation of transformative activity.

At the Educational Informatics Laboratory (OTU, Canada), this study is conducted within a *digital*-learning and -research subculture. Moreover, while acknowledging the challenges of digital divides (Livingstone & Helsper, 2007; Steyaert, 2002; van Deursen & van Dijk, 2011, 2014), and the fact that digital-technology use alone does not necessarily produce desired outcomes, our perspective is fundamentally hopeful. ICTs, when used wisely and competently, are regarded as powerful cognitive tools (David H Jonassen, 1995a; David H. Jonassen & Rohner-Murphy, 1999) which amplify, among other things, an individual's cognitive functioning, participatory opportunities, agency, and empowerment (Amichai-Hamburger, McKenna, & Tal, 2008; Dolničar & Fortunati, 2014; Makinen, 2006). Moreover, networked ICTs, as part of the global Internet, are recognized as having transformed societies around the world and introduced new opportunities for learning, collaboration and assertive action (Klemenčič, 2014; Sandoval-Almazan & Gil-Garcia, 2014). Virkkunen and Newnham (2013), define the DWR intervention as "purposeful action by a human agent to support the redirection of ongoing change" (p. 3).

Seeking to orient DWR as a democratizing interventionist practice, Engeström (1987) emphasizes building dialogical relationships between all actors involved in an

activity system regardless of their vertical or horizontal status within an organizational context. Yamazumi (2006) characterizes this as collaborative, self-organization *from below*.

As shown in Table 2.1, to compare DWR to other organizational change practices (Rasmussen & Ludvigsen, 2009), Virkkunen and Newnham (2013) highlight five facets of interventions: the object, starting point, process, outcome and the general role of the interventionist.

Table 2.1 *Change interventions versus DWR interventions (Virkkunen & Newnham, 2013).*

Aspect of intervention	**Change intervention**	**Formative Change-Laboratory intervention**
Object	A local practice or habitual way of acting of a group	A historically developing system of collaborative activity.
Starting point	The researcher defines the problem, content and goals of the intervention.	Contradictory demands, which the participants encounter in their vital activity.
Process	The subjects are expected to experiment with a given solution. Difficulties are seen as weaknesses in the solution that call for refining.	The context and course of the intervention are subject to multi-voiced negotiation. The subjects gain agency in the processes and eventually take charge of it.
Outcome	The full or partial reaching of the pre-established goal. A solution that can be as such transferred to other settings.	New concepts that may be used as instruments of analysis and problem solving in other settings. Participants' transformative agency.
Researcher-interventionist's role	Owns, designs and controls the process.	Provokes and sustains a collaboratively led expansive transformation process.

Digitalisation is socio-technical construct prevalent in the Industry 4.0 and related systems engineering literature (e.g., (Basl & Kopp, 2017; Hämäläinen, Lanz, & Koskinen, 2018; Pessl, Sorko, & Mayer, 2017; Schuh, Anderl, Gausemeier, ten Hompel, & Wahlster, 2017), (Valenduc & Vendramin, 2017), which makes the theory of transformative learning and the Activity Theory apparatus crucial for socio-

economic development at the present historical moment. It addresses a distinctive set of global discourses, processes and infrastructures that radically (a) extend mainstream digital ecosystems, and (b) subvert the dominant 'operator-tool' metaphor of human-machine interaction (Grudin, 2017). To the first point, digitalisation radically extends our mainstream infrastructure in three ways. First, it features new technologies, including the Internet of Things (IoT), identification-detection systems, 'natural' machine interfaces, additive manufacturing, smart sensors, machine-learning algorithms, high-fidelity virtual reality, cloud computing and intelligent robots ((Miśkiewicz, 2019; Rüßmann et al., 2015). Second, it extends the discourse of technological development to Industry 4.0, which was introduced at the 2011 Hannover Messe (Ghobakhloo, 2018). The historical narrative undergirding this discourse identifies Great Britain as inaugurating the first industrial revolution with the invention of the commercial steam engine, and the United States as leading the second and third revolutions with electricity, electronics and the Internet. In today's fourth industrial revolution, the focus is on deploying 'smart systems' to boost productivity, adaptability and sustainability (Morrar, Arman, & Mousa, 2017). A third extension introduced by digitalisation addresses the increasing capabilities of computational systems to generate new knowledge and novel designs. Although the deployment of machines matching the creativity/dexterity of skilled humans remains the stuff of science fiction, within emerging cyber-physical systems, both human and non-human entities often assume the role of intelligent agents (under favourable conditions).

Digitalisation also radically subverts traditional human-computer interaction paradigms. Grudin (2017) has characterised this as shifting from a 'tool' to 'partner' perspective. Jones at al. (2018) note that even those formerly progressive depictions of humans interacting with machines. Jonassen (1995b) falls short of digitalised systems by limiting themselves to two general interaction scenarios. In the first scenario, tasks are performed by a human operator monitoring and controlling a machine. In the second scenario, the machine performs all tasks under normal circumstances with a human taking over when a problem has been identified. In both cases, a physical human-machine interface is available to be mastered by the operator. The move towards human-machine partnering shifts attention to various cognitive interfaces that introduce new requirements for effective communication and collaboration between agents.

In the end, digitalisation redirects the researcher's attention from concerns about technology acceptance and mainstream digital skills to the readiness of both humans and non-human entities to function together in hybrid systems. I foresee that as learning and work environments become richly digitalised, today's concerns about the adoption and mainstream uses of digital technologies will become moot. Tomorrow's learning and work environments will be constituted by numerous intelligent entities/objects (some human, some not) that comprise a purposeful and seamless ecosystem. More

interesting questions may present themselves. For example, will (human) students and workers always know they are interacting with non-human entities (Warwick & Shah, 2015)? Will they concern themselves with biological-versus-mechanical entity distinctions if an activity system achieves high levels of productivity while maintaining its integrity and alignment with valued goals? Returning to the current research problem, what specific recalibrations must be made today to our digital-skills frameworks to accommodate the techno-social transformations envisioned by Industry 4.0, Society 5.0 and similar innovation discourses?

2.4. Positioning Selected Notable Learning Perspectives

According to John Dewey (1916), the individual and social dimensions of formal education must be considered together. That is, although learning builds directly upon individual experience, this experience is always situated, and interpreted in a society shaped by historically and culturally developed perspectives (A. Jones & Graham, 2015). Similarly, cultural-historical activity theory (Leontiev, 1978; Vygotsky, 1981) suggests that a context is always, to some degree, processed by the learner's mind and reflected back into society. Exploring relationships between the individual and social dimensions of learning become essential as online-learning providers transcend national and cultural boundaries to serve diverse groups of learners (Gunawardena, 2014; Gunawardena, Wilson, & Nolla, 2003).

Inspired by educational reform efforts in Ukraine (Todd Blayone et al., 2018; Mykhailenko, Blayone, & vanOostveen, 2016), *deeply democratized digital learning* was theorised as a 'loose boundary concept' (T. Blayone, vanOostveen, Barber, DiGiuseppe, & Childs, 2017a). Löwy (1990) notes that such concepts often emerge through cross-disciplinary inquiry and facilitate innovations in research and praxis. To lend shape to this concept, Blayone, vanOostveen, Barber, DiGiuseppe, & Childs (2017), introduced four 'boundary markers':

1. It foregrounds emancipatory learning designs, participant roles, group formations, and interactions between people, technologies and ideas—*not* teaching *about* democracy.
2. It responds to a fundamental paradox. Namely, education is considered vital for the development of full human rights. Nevertheless, formal learning relies on authoritarian practices—even in so-called developed democracies.
3. It addresses a concern for extending democratic rights, as opposed to the ascendency of hollow democratic nation-states. Gaventa (2006) notes that 'deepening democracy' challenges the reduction of students in capitalist nations to consumers who express freedoms through market choices.
4. It gains strength through *emancipatory* uses of digital technologies (including global social networks), which are construed as potential

amplifiers of human agency and empowerment when inequalities of access and the challenges of safety and misinformation are addressed.

Within the space bounded by these markers, several tensions emerge, addressing (a) learner and teacher responsibilities; (b) freedom and community; (c) authenticity and formal learning; (d) technology and socio-economic privilege; and (d) responsiveness to the value orientations of cultural contexts. Some of these tensions are well-described in the digital-learning (Bates, 2015) and human rights research (Grant & Gibson, 2013).

The *Community of Inquiry* (*CoI) social-constructivist model* — the most fully operationalised and researched e-learning model (Bozkurt et al., 2015; D Randy Garrison, 2017; Siemens, Gašević, & Dawson, 2015) — foregrounds 'community' as a valued and achievable educational formation even in online environments (D Randy Garrison, 2013; Jézégou, 2010). However, among digital-learning scholars, *community* remains a contested socio-psychological construct with significant implications for the micro-politics of formal learning (Blase & Anderson, 1995). Some leading digital-learning scholars distinguish between group, network and community formations. Furthermore, they argue that the latter, defined by a shared commitment and a high degree of social cohesion, is not always desirable because communities restrict individual freedoms (Jon Dron & Terry Anderson, 2014; John Dron & Terry Anderson, 2014; C. Jones, 2015; Veletsianos, 2016).

The primary founder of the CoI, Garrison, recognises that educational communities take on stronger and weaker forms. He maintains, however, the that full realisation of meaningful educational communities of inquiry requires managerial and directive pedagogues (D Randy Garrison, 2017). The teacher, as a representative of a social consensus, must authoritatively align learning activities with appropriate learning outcomes. Described as 'teaching presence' (TP), Garrison occasionally suggests that all members of learning collectives can serve this function (D Randy Garrison, 2013; D Randy Garrison & Akyol, 2015). Regardless, he emphasises that instructors must actively manage learning in a top-down fashion (D Randy Garrison, 2017, pp. 69-81). In fact, as Dempsey and Zhang (2019) note, the official CoI survey measures teaching presence exclusively with 13 items naming *the instructor* as the singular teaching agent. Those recognising the historical role of students in emancipatory forms of social activism might feel uncomfortable with this one-sided perspective (Jacoby, 2017).

Beginning with a structured discourse analysis of Garrison's major theorisations of teaching presence (D Randy Garrison, 2007, 2013, 2016, 2017; D. R. Garrison & Akyol, 2013; D Randy Garrison & Akyol, 2015), this study charts the development and status of TP. Then, drawing from emancipatory learning (Fleming, 2020; Murphy & Fleming, 2010; Pietrykowski, 1996), non-hierarchical pedagogies (Armaline, 2009; Fremeaux & Jordan, 2012; Fretwell, 2019) and democratic-deliberation research (De

Vries et al., 2010; Englund, 2000; Moore, 2012; Prosser et al., 2018), it will re-theorise TP as a *relational community function*. Within this perspective, teaching presence becomes an 'empowering agent' role to be assumed dynamically and non-exclusively by any community member *or intelligent machine agent*. Critical considerations for any teaching agent would be that they/it address authentic learner needs and deploy forms of communication free from coercion and rank-based discourse (Ewert, 1991; Murphy & Fleming, 2010; Thomassen, 2010). Importantly, however, by following this reasoning, one must address a potential chellenge of pedagogical authority (Fretwell, 2019).

To summarize, the CoI framework (D Randy Garrison, 2017) is a validated and operationally robust framework (Arbaugh et al., 2008; Bangert, 2009; Yu & Richardson, 2015), which achieved broad international adoption (Akyol & Garrison, 2014; Bozkurt et al., 2015; Njiro, 2015; Vladimirschi, 2013), and appared well-aligned with the transformative objectives guiding post-soviet educational reform (ICEF Monitor, 2015; Kutsyuruba, 2011; Loreman et al., 2016; Shandruk & Shatrova, 2015). In our view, however, the CoI also exhibited notable limitations. Its conceptualisation of teaching presence as a community function still accorded a privileged epistemological status to professional instructors, and the categorisation of mediating technologies and related human competences as 'extraneous variables' (for purposes of conceptual parsimony) (D Randy Garrison, 2017) bracketed out the influence of human-computer interaction in shaping the experience of digital learning.

To address these limitations, T. Blayone et al. (2017a) theorised a democratised and technological alternative to the CoI – *the Fully Online Learning Community (FOLC) model*. Since publication, R. van Oostveen has been refining the model's theoretical foundations, adopting a problem-based learning (PBL) approach with this vision of future-oriented learning. The FOLC has several notable characteristics. Being initially conceived as an offshoot of the CoI model, it does not contain "teaching presence" as a distinct dimension of learning to emphasize the need for (re)distributing educational control, reducing power distance between students and educators, and democratizing communication. Moreover, it inserted an emphasis on digital affordances and related digital competences—elements which the CoI considers extraneous. FOLC continues to evolve conceptually as it is applied daily at the Faculty of Education, OUT, Canada, as the basis for teacher education programs and deployed as a research framework for empirically studying the dynamics of fully-online community-based learning. FOLC-based research also recognizes the importance of socio-emotional interaction (T. Blayone, Mykhailenko, vanOostveen, & Barber, 2018; T. Blayone, vanOostveen, Barber, DiGiuseppe, & Childs, 2017b), and the innovative use of open digital affordances (Todd Blayone, 2019) (e.g., using mainstream social media for supporting collaborative inquiry and community-building). Most importantly, FOLC is designed as a flexible model, adaptable to the needs of learners

in a variety of socio-cultural contexts. It is for this reason that we have used it as a guiding model in our own international teaching and learning projects.

As Engeström argues, any *full* learning theory must address at least four central questions: (a) *Who* are the subjects of learning? (b) *Why* are they learning? (c) *What* do they learn? and (d) *How* do they learn? (Engeström, 2001, 2009a). These 'Who,' 'Why' and 'What' questions nudge the researcher to consider political, sociocultural, and technical facets of digital learning.

Different subjects (learning institutions, informal learning groups, teachers, program directors, etc.) with different objectives, influenced by the culture can create various kinds of choices available to learners in the different social forms. Desining or choosing the educational model, we focus on the environment or the context in which learning takes place, and the constraints and facilities provided through that context. When this context is changed by pedagogical intervention, technological affordances, social expectations, or a host of other variables, one can expect change in learning effectiveness or efficiency.

For making effective learning choices, the learner needs independence. Candy (1991) indicates the most context-sensitive variables here: power - the capacity to exercise that independence, and support - the tools, people, and processes learner needs to implement that power. However, for the idea to have any meaning at all, it is necessary to know some of the constraints and factors over which learners may exercise control. M.Paulsen's theory of *Cooperative Freedom (CF)* (1993) describes a range of possible freedoms that might be available to a learner in a formal learning setting. His hexagon of cooperative freedoms describes six dimensions:

- Place: freedom to choose where one learns
- Time: freedom to choose when one learns
- Pace: freedom to choose how fast or slow one learns
- Medium: freedom to choose the media used for learning
- Access: freedom to learn regardless of qualifications or extrinsic obstacles
- Content: freedom to choose what one learns

The model describes pedagogical and administrative challenges with regard to accommodating both individual learners and their cooperation (Paulsen, 2008). CF adopts the discourse of distance or industrialized higher education and is driven largely by a macro-level IT-systems perspective focused on sustaining online learning by offering great flexibility to learners while introducing provisions for optional cooperative activity. CF democratizes education by freeing learners from the constraints of time, space, pace, media, access, content and group dependence (conceptualized as the primary benefits of online learning) in a fiscally sustainable manner through effective implementation of a centralized, educational technology infrastructure. Of particular importance with respect to micro-level learning interactions (as opposed, for example, to macro-level registration and accounting

functions) is a custom Learning Management System (LMS) built to serve NKI, a Scandinavia's largest provider of distance education (Paulsen, 2008). Opportunities for group learning, conceived primarily as peer-to-peer or small-group interaction are facilitated through optional, Cooperative Learner Information Profiles (CLIPs). Like social-network platforms, CLIPS place individual profiles at the center of the social experience, providing a level of "transparency"—that is, group access to an individual's personal characteristics, learning orientation, and level of desire for group interaction. Transparency is a key theme in CF, particularly with respect to determining appropriate levels of community access to system-generated user analytics that reveal potentially sensitive data like the duration of activities, response times, number of interactions, etc. of individual learners and professors.

CF largely avoids theorization regarding the nature of knowledge and learning in relation to the individual and social. Rather, it emphasizes individual freedom from a pragmatic perspective (i.e., "it's what distance leaners want"), and views cooperation in online learning communities as potentially useful, but secondary to the desires of an individual learner. A centralized LMS with carefully constructed social functionality becomes the key enabling affordance driven by individual demand (not institutional mandate). Although social-media platforms such as Facebook are viewed as offering a well-aligned model for social interaction, they are regarded as mostly unsuitable for formal education because they lack the full functionality and educational focus of institutionally managed learning systems.

Both learning models – FOLC (as a digital modification of COI) and CF - build upon ideals and values central to the discourses of democracy and human rights. However, CF and FOLC diverge significantly in relation their individualism-collectivism orientations (Hofstede, 2001). CF emphasizes individual freedoms and personal flexibility with optional opportunities for cooperative or collaborative learning. Conversely, FOLC regards collaborative discourse and critical deliberation as essential facets of deep and meaningful learning. This key divergence has implications for digital-learning affordances. Concerned with the need to sustain flexible online education on a massive scale, CF seeks to leverage the affordances of a customized and centrally administrated LMS. Focusing on processes of democratic deliberation and community formation, FOLC accommodates a flexible mix of synchronous and asynchronous communications tools selected on an-needed basis by members of the learning community. One might theoretical comparison of these models in other directions. However, there is a need for an empirical exploration of these models as situated praxis to explore their transformational power.

Progress is driven not by technologies but by the established practices (Багиев, Длигач, & Соловьева, 2016). In this study, we critically analyse the cases of learning practices from the cognitive, psychological and institutional transformations they cause.

Considering the cases below suggested by the research team members, we pay attention to the issues that emerge from different forms of collaborative, technology-supported, international communicative and learning activities. Rooted in socio-cultural perspectives that construe "ways of knowing" as situated and culturally constructed cognition and praxis, we consider an epistemological orientation a phenomenon that chooses as much as desired. On this way, international perspectives and cultural "cross-pollination" are expected.

This study is focused on creating an ongoing human capacity for positive social changes through overcoming hindering cultural blocks reproduced via education, and supporting the processes of empowerment, emancipation, social responsibility and trust building, digitalization, research, innovations – by using democratized learning (Fig. 2.6).

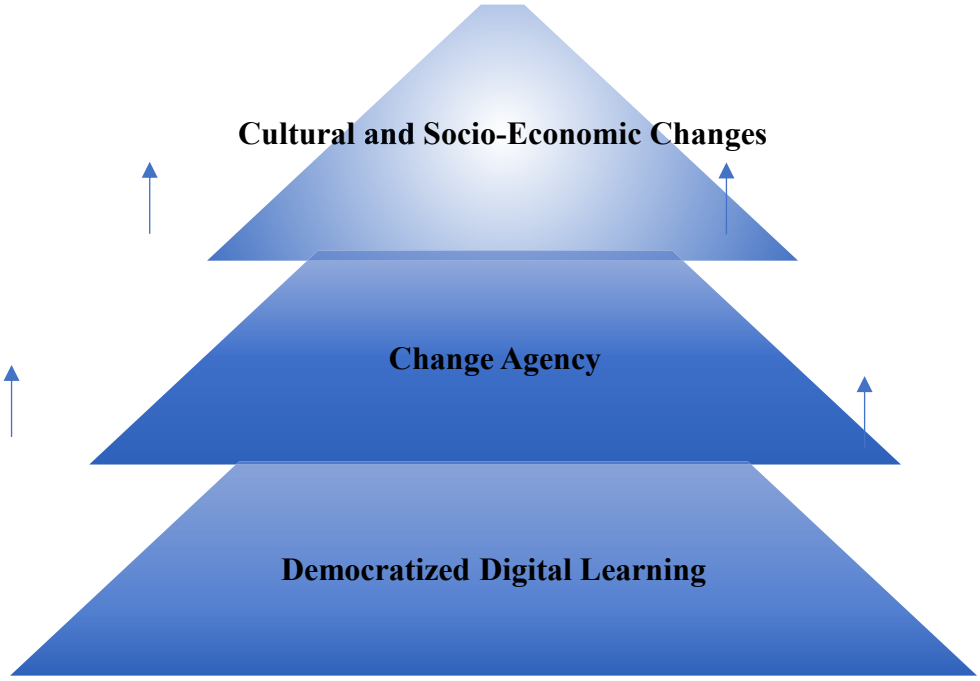

Figure 2.6 *The change potential of democratized digital learning*

In short, the target outcomes are not only new ideas and strategies but increased human transformative capacity and new communities of change agents who have been empowered through participation in the collaborative digital learning programs.

By sharing and analysing these cases, and highlighting some key research findings, we may seed interest in leveraging this experience as a foundation on which to build. One must admit, we still lack a systematic method for positioning digital-learning models in relation to core educational, cultural and technological orientations. To address this gap, we began to develop a framework to help learners and educators position themselves in relation to key value orientations related to power and control,

socio-emotional expression, knowledge building, technology use, comfort with ambiguity, and learning-activity choices.

Already today, and even more in the future, learners will choose the methods of learning that are fitted to them, not to the needs and capabilities of institutions teaching them. That is why, the collaborative, constructivist models, learning in sets and nets, with the aid of collectives, will take over. Furthermore, experience dissemination gains in its capacity to be transformed and transforming as it is applied in different contexts, enabling to do new things and use them in new ways that may not have imagined originally (John Dron & Terry Anderson, 2014).

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SECTION 3. CASE STUDIES. EXPLORING PRAXIS

3.1. CASE STUDY 1. OLENA MYKHAILENKO-BLAYONE
Canada-Ukraine, Fully Online Collaborative Course "Cultural Dimensions and Professional Strategies"

3.1.1. Background, Context, and the Related Research Gap

This study addresses perceptions of online teaching concerning a guiding, social-constructivist learning model in a Ukrainian pilot course conducted within the framework of a Canada-Ukraine partnership. The purpose of the pilot course was to explore: 1) the starting points of interacting educational cultures, displaying by participating universities of Canada and Ukraine, 2) dynamics of cross-cultural adaptation of the learning model guiding the course, and 3) the potential of collaborative online learning as a catalyst for educational transformation/ democratisation "from below".

One of the drivers of this educational discovery was curiosity: are the value of knowledge, teaching and learning styles culturally influenced? Bates (2005) stated that knowledge is not just about content, but also values: mainly, the liberal values. So, intercultural collaboration potentially creates an experience of cultural metacognition, which can give people from different cultures more causes to question their own assumptions (Blanding, 2012). The honest exchange of those assumptions and resolving tensions can help build trust, a social-emotional bond that goes beyond a regular professional relationship (Kim, 2005) and the most valuable asset for any organisation, project, and long-term collaboration (Klewes & Wreschniok, 2009).

From the 1990s, the area of international education has attracted a significant research interest (Debowski, 2003; Dobos, 2011; Goodfellow, Lea, Gonzalez, & Mason, 2001; Knight & De Wit, 1995; Morgan, 2011; Morgan & Carey, 2009; Smith, 2009), largely because "the experience of being a transnational teacher and working in a very different culture forces reflection which can lead to „perspective transformation", that could be a powerful professional development opportunity" (Smith, 2009, p. 112). Many studies focus on investigations of the co-regulated, multi-dimensional interactions and negotiations of actors operating in complex sociocultural contexts. In those contexts, the relationships of power dynamics affect participation, engagement and decision making (Volet & Jones, 2012).

In technology supported, social-constructivist learning, the teacher plays a key role not as a fellow-learner, but as the link to the knowledge community or state of the art in that discipline (Harasim, 2012). For managing the discourse, the instructor builds a "scaffold" that reflects the norms and values of the domain by orienting on the prior knowledge of learners.

Initially, our research questions focused on dynamics of culture (as defined by Hofstede), digital competency (as defined by the General Technology Competency and Use) and student-focused processes of effective, social-constructivist online learning as defined by the COI and FOLC frameworks. However, during the course, different perceptions of online teaching emerged among the professor, research supervisor (author of the guiding model), and professorial observers — all members of the research team. These were conjectured to significantly influence course interactions, interpretations of the guiding model, achievable outcomes, etc.

A literature review was conducted, and a new research branch was grafted onto the main project. This branch adopted Third Generation Activity Theory (Engestrom, 2000) as a model for 1) "zooming out the camera" and exploring tensions within the activity system, and 2) developing eliciting questions to support semi-structured (audio-video recorded) interviews with three teacher-participants from Canada and Ukraine. An adaptation of Activity Theory would guide the initial coding scheme, and additional themes would be allowed to emerge. In the end, the goal was to augment the original research design and provide a complete exploration of the cross-cultural application of a democratised online-learning model for purposes of educational transformation in Ukraine through international partnerships.

The ideal image at academia today is as "a global network with no national borders and no cultural boundaries" (Altbach, 2006). However, higher education systems have lots of variations depending on the socioeconomic and political circumstances they developed in.

Soviet system of higher education, from which the Ukrainian one originated, opposed the western university model on a fundamental level: The pragmatism of practical training contradicted the ideology of academic liberal knowledge and institutional self-governance. Reflecting the core values used to consolidate Soviet Society in general, the critical components of Soviet higher education were uniformity, top-down administration and one-person management organisational principles (Kuraev, 2015). The disintegration of Soviet Union in 1991 brought dramatic challenges but also new role for education. It was supposed to become an essential field of the transition from totalitarian ideology to democracy and pluralism (Kutsyuruba, 2011).

According to (*1990-1999 Ukraine Education for All 2000 Assessment*, 1999), in the early 90s, there was an attempt made for deidelogisation of education. The philosophy of education started adopting a student-centric style, facilitating students' and teachers' liberal self-expression (Kuraev, 2015).

Yet, after more than 20 years of isolation and no integration in global processes (Квіт, 2015), that largely affects the professional identity of the teachers and prevents them from being involved in the international academic environment. The isolation has been caused by multiple reasons, where the most obvious is a language barrier.

80% of academic papers in the world are published in English (*Go Global: Національна програма вивчення та популяризації іноземних мов*, 2015), so, the global access to tertiary education increasingly requires literacy in academic English (Morgan & Carey, 2009). But, a significant number of Ukrainian scholars can only use Ukrainian and Russian written sources, and therefore, they are unable to access the world's largest research stream. Besides that, serious retardation in the social sciences and humanities - the heritage of the Soviet studies structure, when only materialistic, state-centred, military and industrial-oriented research were considered as useful, in particular in pedagogy, traditionally functioning as largely teacher-centred (Brown, 2003; Koshmanova, 2006) - played their role. However, the later research (Matviienko, 2017; Melnyk et al., 2019) notices some shifts occurring in teachers' perception: a subject-centred, where a teacher positions him/herself as a field practitioner, and the student-centred, where the teacher's role is seen as directing students through their learning path. And though these changes are happening slowly, filtering through the prism of a pre-established system of beliefs (Pajares, 1992), the energy of academic activism is growing.

To summarise, the attempts challenging the system of education "from above" encounters considerable culturally-psychological resistance. However, at the individual and micro level, emerged from transforming leadership (Burns, 2003), research interests, personal ambitions and professional networking, active cross-cultural academic interaction seems to be the powerful and effective way to modernise education.

3.1.2. Design and Affordances of the International Online Project

In May 2016, the Faculty of Education, Ontario Tech University (), Canada and the Faculty of Economics and Management, Kyiv National Economic University (KNEU), Ukraine launched a partnership to explore technology-enabled learning and digital-competency development. Within this framework, an educational development and research project was introduced to explore the cross-cultural adaptation of collaborative-constructivist, democratised online learning. To this end, a 10-week fully online course, entitled *Cultural Dimensions and Professional Strategy*, was implemented as a pilot course at KNEU, and as a research case study. The course content raised issues of cultural dimensions (Hall, 1989; G. H. Hofstede & Hofstede, 2001; Inglehart & Baker, 2000) and their influence on economic, business- and personal development. The course was conducted for 38 graduate Strategic Management students divided into two groups. Two of the participating students meanwhile studied at KNEU distantly, simultaneously being full-time enrolled in schools in Poland and Great Britain. The instructor (and the author) - an Associate Professor at KNEU and a Visiting Scholar at OTU, Canada, facilitated the course from

the EILAB, Faculty of Education, OTU, which functions as an international hub for research on human-computer interaction and behavioural science. The EILAB director and project supervisor, Dr R.Van Oostveen, observed and conducted debriefing sessions from the Netherlands where he was pursuing research. Three Ukrainian academic sponsors and observers from two universities joined the weekly synchronous tutorial sessions hosted in Adobe Connect, a web conferencing environment provided by OTU. The asynchronous communication took place on Web Knowledge Forum (WebKF) and open Facebook group "Canada-Ukraine Online Learning". The initial idea was the course to be guided by social-constructivist Fully Online Learning Community (FOLC) model (T. Blayone, vanOostveen, Barber, DiGiuseppe, & Childs, 2017; Childs, van Oostveen, Flynn, & Clarkson, 2015).

The Fully Online Learning Community (FOLC) model (van Oostveen, DiGiuseppe, Barber, Blayone, & Childs, 2016), developed by the Faculty of Education at the Ontario Tech University (OTU) and used at the described pilot course, was conceived as an offshoot of the Community of Inquiry (CoI) model (Garrison, 2011; Garrison, Anderson, & Archer, 2000). It facilitates forming democratised learning communities that reduce the transactional distance between learners and educators, incorporates authentic assessment, and encourages negotiated cognitive outcomes while distributing responsibility and leadership for research activity, critical discourse and constructing knowledge. These FOLC's features respond to the needs of more significant development of 21st-century competencies (Soffel, 2016), transformative and emancipatory learning (T. Blayone, vanOostveen, R., Barber, W., DiGiuseppe, M., & Childs, E., 2017).

FOLC's activity, control, and community orientations respond to the needs of transformative and emancipatory learning as conceptualised by Human Rights Education (Tibbitts, 2005; Tibbitts & Kirchschlaeger, 2010) and Social Justice Education (Grant & Gibson, 2013). Several specific conditions fostering transformative learning identified by Taylor (2007, 2008, 2016), and strongly supported by FOLC-based learning environments, which provide a sense of safety, openness, and trust together with autonomy, engagement, and collaboration, encourage the sharing of emotions as preparation for critical reflection, facilitate the exploration of divergent perspectives, problem solving, and critical thinking. The use of feedback, self-assessment, and self-dialogue assists the transformative learning process (T. Blayone et al., 2017).

The research accompanying the pilot course was originally designed as a mixed-method study relating dimensions of digital abilities and national culture to impact learning processes as defined by the FOLC theoretical framework. By the fifth session of the 10-week course, it became obvious that the research directions, focused on the FOLC framework, miss the consideration of broader forces influencing the choices made by the instructor in relation to course design, synchronous and asynchronous

session facilitation, and interaction with professorial observers. For example, the selected model did not address power dynamics, language barrier, professional identity reconstruction, and the stresses involved in functioning as a research participant. That is why the "teaching presence" (TP) element has the potential to transform. which we explored within the pilot course.

In order to acknowledge and research the broader experience of cross-cultural online teaching, the unit of analysis was extended from in-course interactions to people acting within a broader sociocultural context. In order to achieve this, the FOLC was re-contextualised as a sub-model within a broader field of relationships defined by Activity Theory. Though in the pilot course we aspired to follow the FOLC model, where teaching presence becomes invisible as it equalises the roles of all learning community participants, in our study we did focus on the teaching perspective, since the position of instructor engenders a different set of power relations and cultural historical assumptions, which become especially visible in the intersection of two organisational cultures.

3.1.3. Cultural Contexts and their Interaction in the Learning Partnership

Universities are complex systems functioning in particular sociocultural contexts. According to Vygotsky (1978) and Hofstede (2001), culture is a learned component that adds to inherited qualities and shapes personality. Rothstein-Fisch, Trumbull, Isaac, Daley, and Irma Pérez (2003) narrowed this statement for teaching and learning: "What counts as knowledge or knowing, methods of teaching and means of evaluating students' learning are all culturally defined… and foster certain cultural values." (p.124). Chen, Hsu, and Caropreso (2005) made even stronger conclusion: "Culture itself becomes the context for all teaching and learning experiences"(p.18). So, international learning is a field of interaction (if not collision) of two or more experiences. We modelled this interaction to discover and analyse this potentially transforming process holistically by "zooming-out". We considered both contexts as interacting activity systems, following the Engeström CHAT model (2000) (Fig. 3.1.1).

When two or more systems interact, they produce tensions and contradictions, generating both the participants' resistance and possibilities for transformations. Transformations go through a cycle of "expansive learning" in which existing objectives and standard practices get modelled, analysed and reinvented. The process of desired changes typically starts from identifying contradictions. We use the activity-system apparatus to map state affairs in both interacting systems (Mykhailenko, Blayone, Žogla, & Lubkina, 2019). This process potentially causes partners‘ mutual transformations.

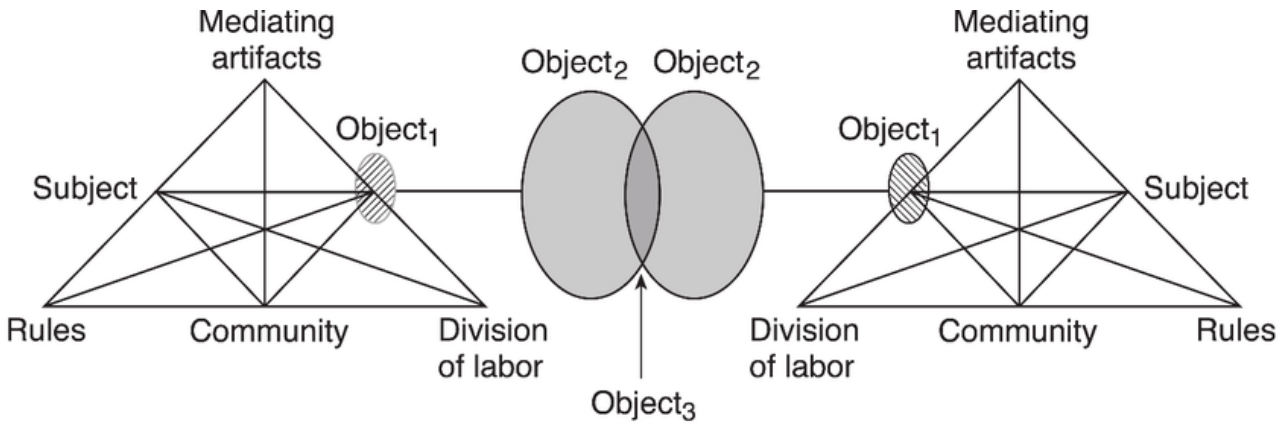

Figure 3.1.1 *Two interacting activity systems (CHATs) (Engeström, 2001)*

Table 3.1.1 defines the elements of CHAT in two professional cultures interacting at the course. All their components, except tools, were seen by the partners differently. As a result, the expected application of the Canadian FOLC model for the Ukrainian context did not happen. Instead, we have a transformed, "hybrid" model.

Table 3.1.1 *The elements of the CHAT of the pilot Ukrainian-Canadian collaborative online course, from both national partners' perspectives*

The CHAT element	Canadian partner ()	Ukrainian partner (KNEU)
Tools	Adobe Connect, Facebook, WebKF	
Subject	Supervisor, researchers	Students, instructor, academic observers
Community	Based on equality (low Power Distance (G. Hofstede, 1980))	Based on hierarchy (high Power Distance)
Rules	Collaborative inquiry	Knowledge delivery
Division of Labour	Shared responsibility and leadership	Teacher's responsibility and leadership
Object	FOLC model international application as a process	Innovative course as a product
Outcomes	"Hybrid" TP model	

Based on these differences, we notice the tensions between the interacting contexts (Fig.3.1.2).

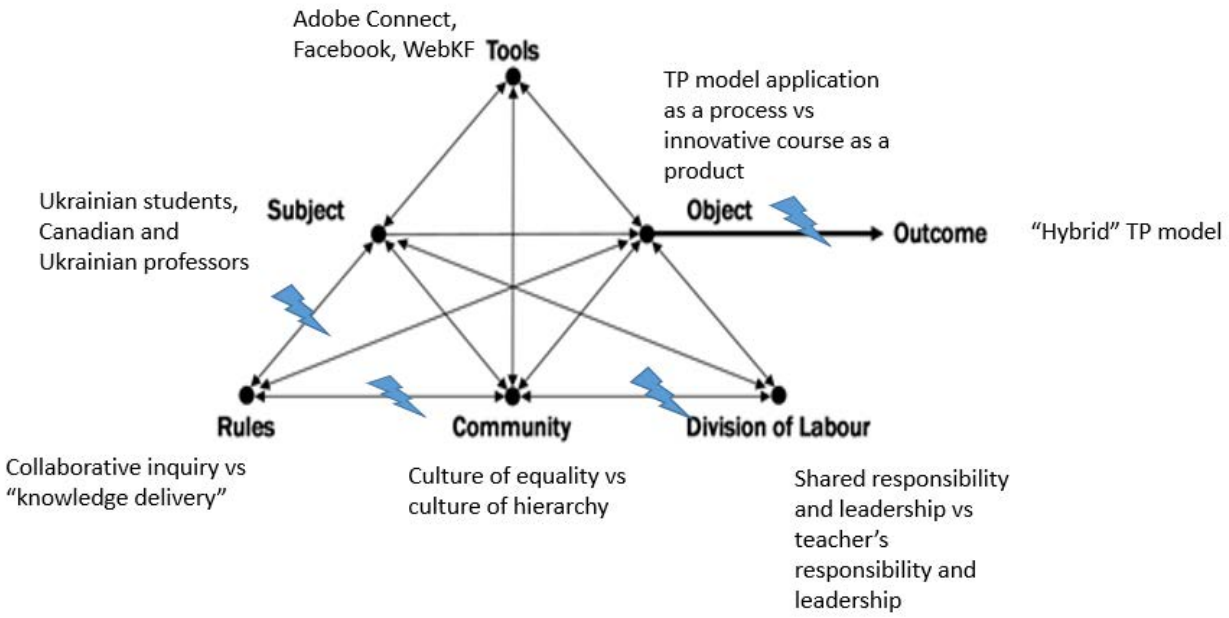

Figure 3.1.2 *Modelling tensions between the viewpoints on the teaching presence of the Canadian and Ukrainian project partners within the international pilot course*

Further, we explored if the tensions caused changes.

3.1.4. Exploring the Process of the Teaching Presence (TP) Transformations

To find out what causes the tensions, we designed semi-structured interviews for the representatives of the institutions partnering in the project. Our interviewees were: 1) an author of the FOLC model, Professor at OTU, Canada (initials R.O) and 2) the course observer, Professor at KNEU, Ukraine (O.H.). We designed a questionnaire based on the CHAT model elements (Table 2), and the respondents were supposed to give answers face-to-face (R.O.) and via Skype (O.H.) to the course instructor (and the author of this chapter).

Table 3.1.2 *The interview questionnaire*

CHAT elements	Questions	Notes
Subject	1. Tell me a bit about yourself. 2. What do you like about being a university professor? 3. What are some challenges of being a university professor? 4. Tell me about your role in the pilot course?	
Object (Goal)	5. How would you describe the ideas guiding the pilot course? 6. What student learning outcomes did you expect from this pilot course?	

	7. What did you learn from your participation in this pilot project? 8. What does democratised learning mean to you?	
Community (Culture)	9. With what national, ethnic and/or religious culture do you identify? 10. How do you see this cultural identity relating to your professional practice? 11. How would you describe your university's culture? 12. What cultural differences did you detect between you and other professorial participants?	
Instruments (Technologies)	13. How would you describe the role of digital technologies in this pilot course? 14. How would you improve the use of technology?	
Division of Labor/ Rules/Tensions	15. Did you perceive any tensions or conflicts in the course? 16. What things might you do differently next time?	
Outcomes	17. From your perspective, what beneficial outcomes did the course produce? 18. What similarities or differences between the student participants and Canadian students did you notice? 19. What similarities or differences between the students' participation in traditional and pilot courses did you notice? 20. What obstacles may have prevented more positive outcomes?	R.O. only O.H. only

Then, the interview texts were analysed and compared to each other element-by-element. The interviews had proven that the representatives of the interacting educational cultures assessed the processes differently. To have a deeper understanding of the nature of those differences, in our analysis, we put together two models: CHAT (Engeström, 2000) and four dimensions of Hofstede's six-dimensional model (2011):

"Power distance index (PD): The power distance index is defined as "the extent to which the less powerful members of organisations accept and expect that power is distributed unequally. A higher degree of the Index indicates that hierarchy is clearly established and executed in society, without doubt or reason. A lower degree of the Index signifies that people question authority and attempt to distribute power.

Individualism vs. collectivism (I-C): This index explores the "degree to which people in a society are integrated into groups". Individualistic societies have loose ties that often only relate an individual to his/her immediate family. They emphasise the "I" versus the "we". Its counterpart, collectivism, describes a society in which tightly integrated relationships tie extended families and others into in-groups. These in-

groups are laced with undoubted loyalty and support each other when a conflict arises with another in-group.

Uncertainty avoidance (UAI): The uncertainty avoidance index is defined as "a society's tolerance for ambiguity", in which people embrace or avert an event of something unexpected, unknown, or away from the status quo. Societies that score a high degree in this index opt for stiff codes of behaviour, guidelines, laws, and generally rely on absolute truth, or the belief that one lone truth dictates everything, and people know what it is. A lower degree in this index shows more acceptance of differing thoughts or ideas. Society tends to impose fewer regulations, ambiguity is more accustomed to, and the environment is more free-flowing.

Masculinity vs. femininity (M-F): In this dimension, masculinity is defined as "a preference in society for achievement, heroism, assertiveness and material rewards for success". Its counterpart represents "a preference for cooperation, modesty, caring for the weak and quality of life". Women in the respective societies tend to display different values. In feminine cultures, they share modest and caring views equally with men. In more masculine cultures, women are somewhat assertive and competitive, but notably less than men. In other words, they still recognise a gap between male and female values. This dimension is frequently viewed as taboo in highly masculine societies".

Hofstede defined culture as "software of the mind" (1980). That is why cultural analysis is essential for understanding internal drivers of people's behaviours and attitudes, particularly for noticing and assessing the occurred personal transformations within learning interactions.

In the Table 3, we presented the analysis of the interview contents, more accurate, their fragments revealing the respondents' views on the pilot course (col. 2 and 3). Also, we analysed the statements focusing on the cultural dimensions PD, I-C, UA, and M-F (col. 4).

Table 3.1.3 *The interview analysis*

Elements of CHAT (Engeström, 2000)	Related fragments from the interviews		Displayed cultural specifics (G. Hofstede, 2001)
	R.O (Canada)	O.H. (Ukraine)	
Subject	I work with graduate students. There's the challenges of trying to have an on-going conversation with colleagues who see life as being very different than I do. So the emphasis that has been placed in this	I teach, I strive to improve, I develop. Now I'm actively engaged in professional training. I graduated courses on information and communication systems in the economic university. I actively pass professional courses online, including MOOCs. I teach.	"I work with graduate students" vs "I teach" – different **PD** "Challenges to have a conversation with colleagues" vs "Circle of friends" - **I-C**

	faculty on teacher education teacher training is very much at odds with where I'm primarily interested. I think, they don't know what that's like and they are challenged by lack of understanding of the world outside of their particular institutional educational system	Very wide circle of friends. This is an on-going exchange of emotions. Not even knowledge, not even information, namely emotions. Because when you have the whole day immersed in this communication, of course, you are inspired by interests of different people, often far beyond just economic environment. This is probably the most interesting. Always easy to work with a team that shares your interests, your views, your attitude to work. When you fall out of this team or this team splits, that's where difficulties begin, self-determination problems occur, you force yourself to do something. It is the most difficult part for me.	"Not even knowledge, but namely emotions". **M-F (F)** "They are challenged by lack of understanding of the world outside" vs "When you fall out of this team or the team splits, that's where self-determination problems occure." **I-C**
Objectives	I wanted to simulate the world outside the laboratory if you want and to make that model that you're developing as rich and explanatory as possible for as many different settings. My involvement was somewhat at the periphery. I'm not sure that I really had a lot of expectations. I was trying to drive as much diversity as possible into the environment. As an entire team of researchers, we would be able to take a look at what were the responses	I saw my role at the course as coordinator as a link between the active participants of the project. I perceived this role rather passively. But it seemed to me immensely important because it was necessary to maintain the emotional intensity. The goals had two sides. 1) it is actually a form how the material is presented, the interconnection of all the participants, the online format. Because in such a version, it was absolutely new and interesting. This aspect was attractive. 2) An informative aspect of the course.	"Ukrainian students were much more homogeneous in terms of their reaction". **I-C (C)** " But it seemed to me immensely important because it was necessary to maintain the emotional intensity" – **M-F (F)** To explore "responses of the students, when they were presented with opportunities for decision-making, for taking charge for their own education". "It was absolutely new and interesting. This aspect was attractive" - **UA**

	of the students, when they were actually presented with opportunities that gave them power for decision-making for taking charge out their own education.		
Community	There is a greater transactional distance in the Ukrainian context then there is necessarily in a North American context. Usually, North American students have lower transactional distance (graduates lower than undergraduates), but some elective students still have huge transactional distance between the instructor and the student, asking what is it that you want me to do and how do i go about doing it. I think it's because of the way that they are actually receiving this transactional distance in other contexts. (Diverse students' groups in Canada).	Students are accustomed to the fact that they are trained with some information. But here it was necessary to be engaged in debates. They behave awkward, because they had to understand they are the producers of new information. That was probably the most challenging part.	"Greater transactional distance in the Ukrainian context". "North American students have lower transactional distance (graduates lower than undergraduates)". But some students still have huge transactional distance between the instructor and the student, asking "what do you want me to do" "and how to do". I think it's because of they are receiving this transactional distance in other contexts". - **PD** " Students are accustomed to the fact that they are trained with some information. But here it was necessary to be engaged in debates. They behave awkward, because they had to understand they are the producers of new information. That was probably the most challenging part". – **PD, cultural diversity**.
Instruments	We have much better access to technology affordances now.	Communication with a video stream is essential. When you see the person's face, with her emotions, eyes, it is a big plus to the learning process. On the other hand, in, when the Internet did not work well, when the system get crashed, of course it was frustrating. This causes negative emotions, they are extrapolated on the entire	"For us, it has been an little overcome of ourselves" - **UA**

		course. When you're nervous because you can't hear, see, and something is entirely missed out, of course it is not perceived very positively. But on the other hand, it was the first experience. For us, it has been an overcome of ourselves. Second, still, need to pay attention to our digital infrastructure in Ukraine ... Not all participants had the Internet powerful enough to pass video traffic... Another important point is improvements in digital skills. It seemed to me, everyone knew Skype, how to communicate in small groups. But there are very few people who use them for education.	
Rules	When we first started, we haven't written the policies. Then we've got procedures for the policies and programs. It made the atmosphere distinctly different than what I had experienced in the beginning. Canada has built-in traditions. The last 3 years we can see the signs of buerocratization. More difficult to do something new. Now we have established policies, there are additional restrictions in terms of being able to do something new, more flexible. However, we still have sources of innovations. We had the infrastructure available to be able to move. If you take a look at my work in the Eilab and	This format of communication online, collaborative study format without a clear preliminary scheme (go there, take it, write like this, outlined as here) - it was very interesting. What students did, despite our inflated ideas about how this should be done, in my opinion, they have coped very well. The university is a state structure and the principle of hierarchy in everything is there. It is quite clearly expressed in decision-making, in the implementation of these decisions, etc. On the other hand, comparing with other universities, the hierarchy that we have here is relatively soft. There are some strict traditions, but you can always negotiate. But I would not say that it isn't a democratic culture. But in general, quite a rigid	"When we first started, we haven't written the policies. Then we've got procedures for the policies and programs. It made the atmosphere distinctly different. The last 3 years we can see the signs of buerocratization. More difficult to do something new". "This format of communication online, collaborative study format without clear preliminary scheme (go there, take it, write like this, outlined as here) - it was very interesting. What students did, despite our perhaps even inflated ideas about how this should be done, in my opinion, they have coped very well". "The people I work with are not indifferent to their work. And because of this, they are ready to change, even if it contradicts with their traditional views".

	the development of the FOLC model, i think that's a direct derivative of the the openness and the emphasis on innovation that has been part of the culture here at OTU.	hierarchy, quite strong traditions ... In the present state of our society - it is not positive. At the same time, those people I work with, most of them - are very professional, nice people, with high moral character-ristics, not indifferent to their work. And because of this, they are ready to change, even if it contradicts with their traditional views.	**- UA** "The university is a state structure, and the hierarchy is in everything there" - **PD**
Outcomes	The instructor Elena and the students: there was a desire to move into a freer kind of peace but that there was an acknowledgement of prior traditional structures etc., that mitigate against the move to other kinds of things, and as a result of that, you end up with, I don't I hesitate to use the word, hybrid implementation of the model that I hadn't seen before. But it was just a result of not being able to actually move as quickly and i think this is on the part of the instructor as well as the students as well as the interactivity between the two sorts of expectations. But I've got a feeling, we do something new and we change the culture in a more flexible and innovative way.	There is a stereotype among Ukrainian professors, that our students are "the passive mass ", not interested in the problems that arise in the learning process. For them, the most important thing is to get their marks. In this project, I suddenly discovered that our students are not passive, but deeply interested in learning. They are ready to take part in some kind of reforming processes, willing to share their views on how the learning process should be organized, what it should be filled with. These things are very important. Coming out of the comfort zone has played a positive role, and as a professor, I've seen the students from a new perspective. When the first projects where published in the Facebook group - frankly, I was shocked, in a good sense. I was struck by the depth of students' research, done in a very limited time. These are probably the most important results obtained.	"There was a desire to move into a freer teaching style but that there was an acknowledgement of prior traditional structures. You ended up with a hybrid implementation of the model that I hadn't seen before. I think, this is on the part of the instructor, as well as the students, as well as the interactivity between the two sorts of expectations. I've got a feeling: we do something new and we change the culture in a more flexible and innovative way." " There is a stereotype among Ukrainian professors, that our students are "the passive mass ", not interested in the problems that arise in the learning process. They are ready to take part in some kind of reforming processes, willing to share their views on how the learning process should be organized, what it should be filled with. Coming out of the comfort zone has played a positive role, and as a professor, I've seen the students from a new perspective – **UA, F-M (M).**

Tensions	Some of the tension was when the other instructors and administrators showed up in the course. I could see the dean of the faculty, he wasn't really comfortable with moving in the direction away from his traditional understanding of what education was all about. As a result, at least initially, he tried to impose a certain kind of an authoritarian procedure. I think that led to not only tension but more, it led to confusion, to obvious contradiction of an unfavorable nature between the instructors and the administrator. However, in my PhD studies as well as my experiences in developing new programs at the high school, there's always a need for tensions, otherwise there is no need for change.	We discussed with colleagues that we feel don't belong to our mental and cultural circle because you became more "western" in the perception of problems, and some other things. There is a feeling that you are no longer with us... You do not see these problems, do not understand them as we do... On the other hand, I understand that if we now ask some of my colleagues who participated in the project, perhaps the same would be said about me: I do not understand everything as it used to be... But we are all different, and I do not think it has something to do with cultural differences. It is rather individual characteristics. There was irritation associated with the technical issues. The students were anxious when they got disconnected, missed some material that they can not understand the context. These were the reasons for rejection and exasperation. In the beginning it was very serious, they worried this will have a negative impact on their academic performance. But after some time when they were imbued with the spirit of this project, this tension gradually came to naught. They realized that this is not important, that everything can be made up in other ways, the next day, using other forms of communication: via e-mail and Facebook. I had already used this experience for another course.	"You could see the dean of the faculty, he wasn't really comfortable with moving away from a traditional understanding of what education was all about. As a result, he tried to impose a certain procedure on to the actual course. I think that led to confusion, to obvious discourse of a unfavorable nature between the instructors and the administrator – **PD, UA** " We discussed with colleagues that we have a feeling that you no longer belong to our mental and cultural circle because you became more "western" in the perception of problems and some other things. There is a feeling that you are no longer with us" – **I-C (C)** " The students were anxious when they got disconnected, missed some material that they can not understand the context. These were the reasons for rejection and exasperation. In the beginning, it was severe, they worried this will have a negative impact on their academic performance." "They did not see the practical value, they didn't know what to do next with this knowledge" - **UA**

		They did not see the practical value and didn't know what to do with this knowledge. But when there started sessions with university graduates from different countries, it has been an explosion of emotions. Our students decided that cross-cultural experience was the primary value of this course.	

The analysis let us make a few conclusions and the direction for future studies about the TP transformations that emerged from the observed international interaction:

1) Both interviewees felt tensions while working on the innovative project (the cultural pressures that occurred in both groups are shown **bold**):

Subject	PD, **I-C,** M-F
Objectives	M-F, UA
Community	PD
Instruments	UA
Rules	UA, PD
Outcomes	UA, M-F
Tensions	PD, **UA,** I-C

As we can see, describing themselves as activity subjects, R.O and O.H. demonstrated cultural differences in PD (R.O. lower and O.H. higher power distance), in M-F (the Ukrainian professor demonstrates more "feminine" values like emotional support and caring), and mostly in I-C (the Canadian respondent indicates difficulties in getting along with colleagues, which points to an individualistic attitude, but the Ukrainian respondent talks about "the circle of friends" (a collectivistic sense).

The differences in M-F are also noticed in their responses regarding Objectives and Outcomes, in PD – in the views on the Community and Rules, in UA – in the perception of Objectives, Instruments, Rules, and Outcomes. Notably, UA (Uncertainty Avoidance) was the most frequent source of tensions between the teams.

UA, PD and I-C also appeared to be the most frequent cause of tensions. It seems that the constructivist, collaborative FOLC model, where teaching presence does not come beyond facilitation, felt too uncontrolled, unpredictable, spontaneous, and so

uncomfortable for the Ukrainian group. Traditional hierarchical relations (high PD) and collectivistic perceptions reinforced the teachers' discomfort. As a collaboration result, the course “ended up with a hybrid implementation of the model that I haven't seen before”, as the FOLC model‘s author concluded.

2) Despite that, both respondents indicated the transformative character of this experience. “I've got a feeling: We do something new, and we change the culture toward more flexible and innovative way,” – R.O. admits. “I suddenly discovered that our students are not passive but deeply interested in learning. They are ready to take part in the reforming process. As a professor, I've seen the students from a new perspective. These are probably the most important results “, - O.H. adds.
3) O.H. also describes the transformations that happened to the participating students during the course: “They were anxious… that the technical and other issues would affect their performance. But with time, they got imbued with the spirit of this project, and the tension gradually came to nought. They realised they can learn in new ways”. This observation is a sign of decreasing UA and better attitudes toward changes, adaptability, and importance of soft skills: “They did not see the practical value and didn't know what to do with this knowledge. But later, our students decided that cross-cultural experience was the primary value of this course”.
4) “There's always a need for tensions; otherwise there is no need for change”, - this way R.O. underlined the benefit of the project experience.

Tensions as a source for changes also sounded in the feedback voluntarily provided by the students. They often compared their traditional and new learning experiences. We identified eight emerging topics in the feedback, and reflected them by frequency in the diagram (Fig. 3.1.3).

The students mostly stressed the issues and differences between the pilot course and their previous learning experience in freedom of speech, self-expression, equality, power distance, digital skills. Generalising these facts, we can assume some democratised attitudinal transformations and skill development.

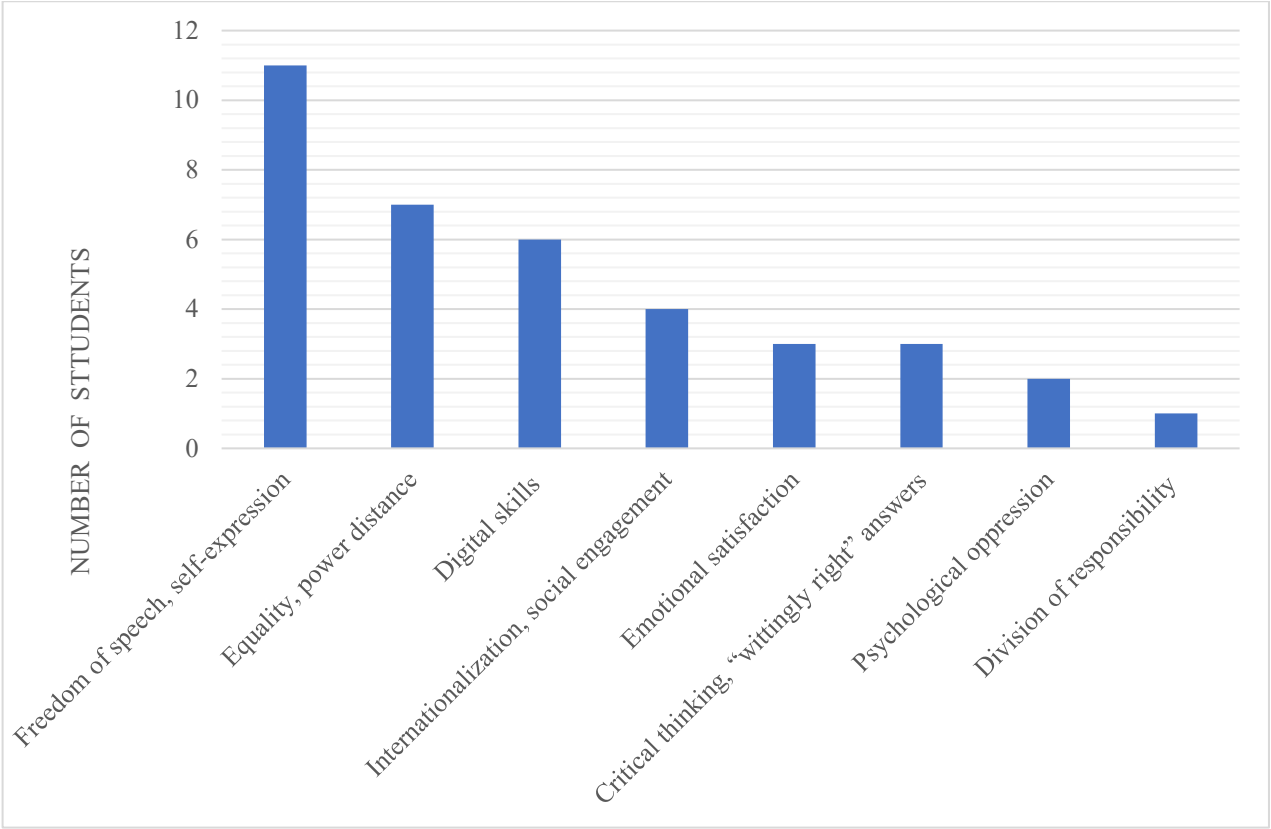

Figure 3.1.3 *Students feedback on the pilot course transformational experience: the emerging topics*

Here are a few students' quotations, which can back up our assumption about the transformational experience they received via the international collaborative online course:

Everyone can express his/her opinion with no restrictive frames. We could have different points of view. (Anna)

Most teachers and students work according to traditional methods where you memorise book texts. Our course let me understand that I should always express my opinion without fear and shame. Indeed, online learning creates favourable conditions for reducing power distance. (Iryna)

I noticed that I do not like the absence of the "right answers"… I always need to know whether I'm right. This slightly hampers but a new feeling for me. Now I have something to reflect on… (Angela)

After our classes, I feel inspiration, curiosity, lots of thoughts… If all classes were like this, students would never skip them, I'm sure.

I've got pleasure from learning and communication at this course. Frankly, this is quite a new feeling. (Valentina)

My advice is to start such courses with younger students. They already understand the system but did not let it through yet, and still open to changes and innovations. (Andrey)

I actively participated in discussions because you were interested to hear our thoughts. (Daria)

The openness truly impacted our group. (Oleksandr).

The quotes prove again, the cross-cultural, collaborative, constructivist digital learning causes a particular transformational impact on all its participants.

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3.2. CASE STUDY 2. OLENA HREBESHKOVA & OLENA MYKHAILENKO-BLAYONE

Transformational Challenges of E-learning at the Vadym Hetman Kyiv National University of Economics, Ukraine

3.2.1. Background and Context

KNEU is one of the oldest state universities in Ukraine, founded in 1906. The university has more than 11 thousand students trained by about 840 teachers in three study forms - full-time, part-time and distance learning at eight faculties. For decades, KNEU was considered among the most successful economic universities of Ukraine; however, since the mid 2010s, its positive ranking has not remained stable ("Рейтинг Webometrics-2019," 2019). The fierce competitiveness between universities, frustrating figures of declining student enrollments, growing student international mobility with double degrees, combining study and work, the vast popularity of open free online courses have caused the urgent need for distance learning technology transformations in KNEU.

The first platform for distance learning courses at KNEU integrated the software environment WebCT (World Wide Web Course Tools). During 2001-2013, more than 200 distance learning courses were designed on this platform, mainly for the needs of postgraduate education.

During this period, the university has implemented several transformational digital innovations. One of them was the first collaborative-constructivist online learning project in Ukraine (2016) in partnership with Ontario Tech University (OTU), Canada (T. Blayone, Mykhailenko, van Oostveen, & Barber, 2018), which presented a new pedagogical paradigm. Based on the Fully Online Learning Community model, the course Cultural Dimensions and Professional Strategies introduced digital technology (Adobe Connect and Knowledge Forum) as a tool for achieving new, democratising student-teacher relationships. Another international partnership - with the Dutch company Diamond FMS ("Diamond FMS," 2020) - helped organise a new business analysis training and research experience. And one more creative project, which gave KNEU a competitive advantage in attracting new students – yesterday's schoolchildren - is a yearly, Ukrainian-wide, gamified business tournament, Business Strategy ("VIII Всеукраїнський бізнес-турнір Стратегія фірми-2021," 2021) So, KNEU is an active seeker of creative forms for digital transformations of its different learning and business processes.

3.2.2. Target Transformations and Strategic Goals in Digitalised Learning

There are three generations in the suggested evolution of e-learning (Dašić, Dašić, & Serifi, 2012). E-learning 1.0 focuses on creating learning content by a teacher-expert using mostly static sites and LMS (like MOODLE). E-learning 2.0 is based on the capabilities of social services (blogs, messengers, networks) and focuses on providing teacher-facilitator-group communication (including collaboration tools such as Microsoft OneNote Class Notebook and Microsoft Teams). The third generation of E-learning - 3.0 - uses virtual reality and artificial intelligence in the learning process (e.g., Microsoft Kinect, Second Life) focused on personal learning. Thus, there is a trend towards individualisation and networking with a fundamental change of the teacher's role in the educational process. Are university professors ready for that?

The observation of e-learning practice shows that today in Ukrainian universities we have quite confidently mastered the first generation: distance and blended learning on the MOODLE platform (Пасічник, 2017)). Using open online courses on Prometheus, Coursera, Udemy and other MOOC platforms is common for many universities in Ukraine. Some teachers create their own online courses (the author has personal experience designing and placing her course on Udemy (Grebeshkov & Hrebeshkova, 2017). In the learning process, teachers use messengers, social media and electronic services like MS Teams, Zoom, Skype, YouTube, Padlet, Trello and others. However, we must admit that teachers mainly use them for transferring content to students, not for active interaction and new knowledge production.

The powerful potential of the transition to the second generation of e-learning lies in social computing – integration of social science and IT, implementing blogs, social networks, wikis, and virtual reality, which help provide e-social interaction and online collaboration (T. J. Blayone, Barber, DiGiuseppe, & Childs, 2017). Social computing is the basis for global development of communities, focused on common goals and meeting the individual interests of the participants. One can assume that the global pandemic has intensified the spread of social computing.

Our social computing experience includes two educational projects – those mentioned above, the Ukrainian-Canadian online course Cultural Dimensions and Professional Strategies and the interrelated research project of digital skills measurement (2015-2016) (T. Blayone, Mykhailenko, Kokhan, et al., 2018; T. Blayone et al., 2017) and designing online courses on the Microsoft platform OneNote Class Notebook (Гребешкова, 2017).

This experience in implementing blended learning made us target the following areas of social computing as the most promising for universities:

- deployment of communication and knowledge platforms (e.g., Microsoft Office 365);

- online courses design (and clusters of online projects in the future) with integrated online communication tools (video blogs, spaces of joint work, social networks). They will help to create new knowledge jointly by all educational process participants, using both synchronous and asynchronous interactions;
- expanding the circle of participants in the educational process by involving external experts and professionals: potential employers; practitioners; researchers; politicians, etc. This direction might evolve toward dual digital education.

3.2.3. Approach and Technological Orchestration

Online learning transforms relations between the participants of the educational process in many aspects and changes their expectations regarding its form (electronic communication) and nature (motivation and learning outcomes). There are various blended learning formats and diversely used IT tools. For example, KNEU's educational process uses Learning Management Systems (MOODLE) combined with professional information systems (for example, for management accounting - 1C, for financial and business planning - Diamond FMS, etc.), business-class communication platform Microsoft 365, open online courses (Prometheus, Udemy, Cousera, etc.), messengers (Viber, Telegram) and social networks (Facebook, Instagram). The provision of information used in courses is diverse: along with electronic textbooks and slide lectures, video and audio materials from open sources are used and teachers use video lectures, vlogs, online testing, etc.

To identify the students' expectations about blended learning, in early 2017, we surveyed KNEU students. They were asked to determine their preferences regarding 1) media content (“electronic resources” or “printed paper”); 2) types of classes (“theoretical training” - “practice-oriented training”); 3) forms of knowledge control (“testing” - “solving practical problems”); 4) ways of interaction between participants of the educational process “individual work” - “group work”); 5) the role of the teacher in the learning process (“teacher-authoritative mentor” - “teacher-partner”); 6) forms of classes (“online” - “offline”). Each respondent could either clearly state her/his preference of one of the options or agree with both. To explore possible changes in the profile of student preferences and compare these with teachers' preferences, in 2020 (after the forced switch to distance learning), we conducted two similar surveys. The comparison is displayed in Fig. 3.2.1.

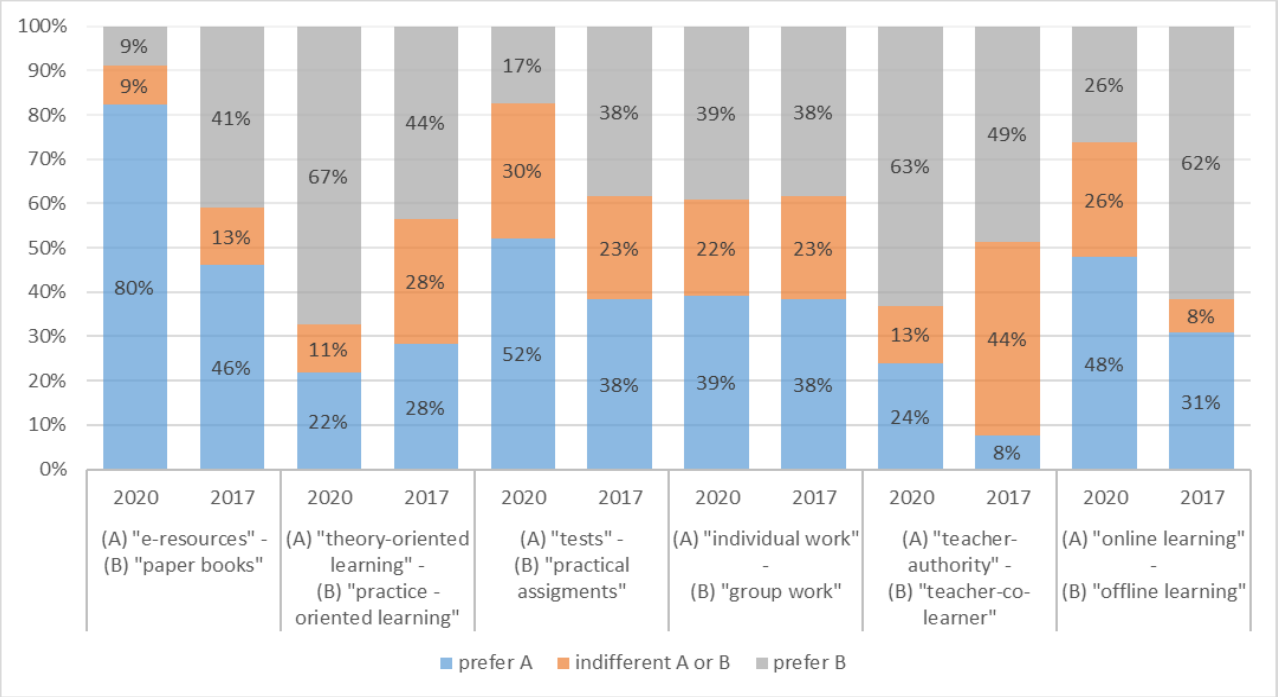

Figure 3.2.1 *Comparison of KNEU students' preferences regarding the components of the blended learning model in 2017 and 2020*

One can see that from 2017 to 2020:

1. The preference for electronic media almost doubled: from 46% up to 80%. It points out that printed textbooks might be not needed at all in the near future.
2. The need for practice-oriented classes increased significantly: from 44% to 67%, while the interest in theoretical classes dropped down from 28 to 22%. Obviously, students feel a lack of practical skills.
3. Against this background, the distribution of preferences regarding the form of control seems illogical. If in 2017 testing and practical tasks were almost equally accepted by students (with a bit of priority for testing), in 2020, the attractiveness of practical assignments decreased significantly, while the preference of testing increased. This looks even stranger since respondents simultaneously complain about the low level of tests and the lack of feedback from the teacher after testing. The contradiction between the desire to have more practice-oriented learning and the choice favouring tests points to the problem: the students' ability to solve practical issues has decreased, and they are aware of that. Therefore, they “vote” for a practical orientation to learning. However, realising their lack of practical skills, students choose tests because this sort of knowledge control requires less intellectual effort and provides an opportunity for guessing the correct answer. Indeed, this trend is frustrating.

4. There have been almost no changes with respect to the methods of educational interaction of students. Both individual and group assignments remain equally acceptable for students.
5. Student prefernces were clearest when it came to the teacher's role in the educational process. The desire to see a teacher as a learning partner increased from 49 to 62%. In much the same way, the perception of a teacher as an authoritative mentor dropped from 34 to 8%. These changes point out the urgent need for the democratisation of student-teacher relationships.
6. Despite the forced transition to online learning, students appreciated the benefits. Those choosing to favour online learning increased from 31 to 48% and those favouring mixed forms - from 8 to 26%.

Since teachers are also learning process participants, in 2020, amid being quarantined, we decided to conduct a similar survey to compare student and teacher attitudes to components of blended learning (Fig. 3.2.2).

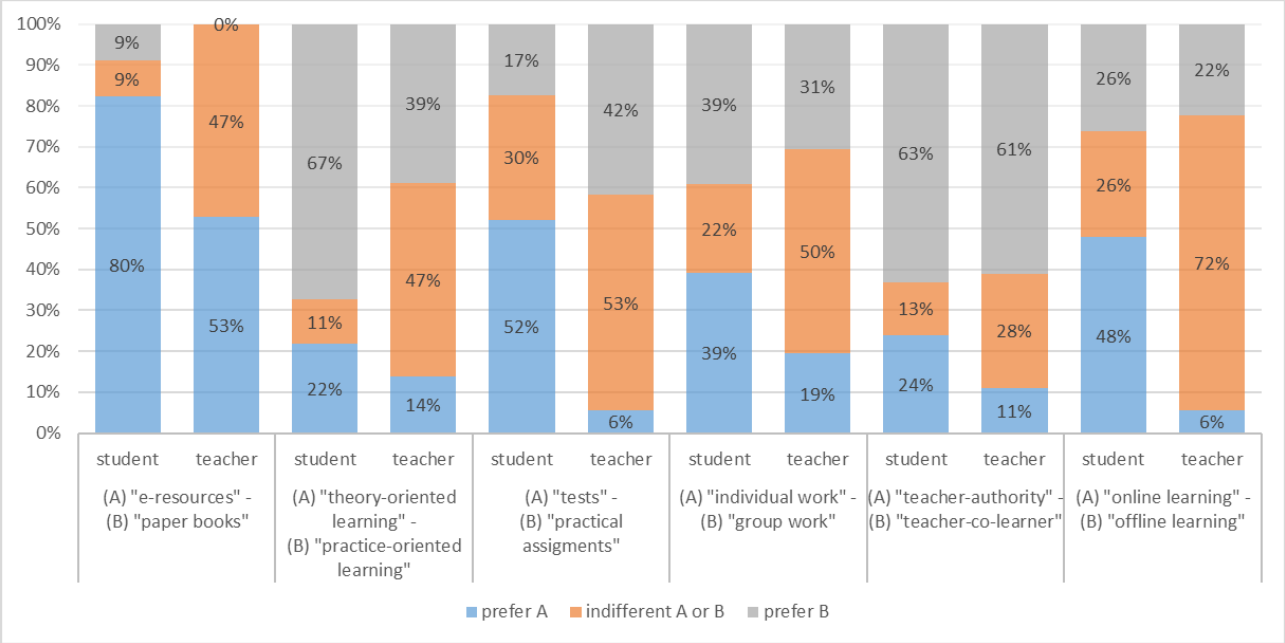

Figure 3.2.2 *Comparison of the KNEU students' and teachers' preferences regarding the components of blended learning, 2020*

Teachers are almost equally committed to paper and electronic media in contrast to students who are clearly more inclined to take information from the internet. Teachers are less radical than students in focusing on practice rather than theory, but nine times less likely than students to rely on non-test scores as a tool to assess knowledge. Unlike students, teachers prefer solving practical problems, which involves findings and arguments. This difference again speaks about the hidden issues in the balance of theory and practice.

Students are equally and fundamentally divided into two groups preferring either individual or group work. Teachers mostly prefer a mix of both. This difference indicates that individualisation of the learning approach is needed, depending upon the student's personal cultural orientation - individualistic or collectivistic.

Offline and mixed classes are more valued by teachers, unlike students, who choose the online form twice as often as others. This conservatism among teachers might indicate a desire to maintain their physical presence at the workplace associated with employment stability. At the same time, students' preferences reflect their reduced interest in a traditional classroom when they also need, at least, a part-time job.

The changes in students' attitudes towards online learning are likely to get catalysed by introducing a mandatory distance learning regime due to the COVID-2019 coronavirus pandemic and the shortcomings of this process. Thus, the survey of KNEU students, conducted in April 2020, showed a distortion of the principle of mutual responsibility for learning by students and teachers. Most of the work was transferred to students as short-time individual assignments with inadequately low scores. According to student feedback, teachers did not pay enough attention to providing explanations and feedback on completed tasks. Indirectly, this was confirmed by data on the use of online interaction tools by teachers. Mostly, they used non-collaborative information transmitters: e-mail (79,9% of teachers) and messengers Viber and Telegram (35,3%). Other available online tools, which could facilitate comprehensive distance learning (MOODLE, Google Class, Microsoft 365) were used by less than 15% of teachers. In addition to the tendency to shift the issues of online transformation onto students, teachers demonstrated low digital skills and little interest in developing them.

The COVID-quarantine underlined severe organisational and methodological problems at the university: unbalanced workload for students due to the significantly increased number of assignments; no single platform (“entry point”) to the content of the courses, which required more time and resulted in nervous tension; the lack of clarity in scheduling; the lack of video communications with the teachers due to teacher reluctance. Observations showed an interesting trend: the graduating students had higher grades than other distance-learning students. Probably, not only are the graduating students more organised and independent than the “younger” ones, but also both they and their teachers are more grade-focused. In online learning, when teacher-student asynchronous interaction is nebulous, and workload on both sides grows significantly, there is a potential threat of lower quality learning outcomes for basic-level courses, which in the near future will result in a decrease in educational quality in general. After a year of quarantine, one can hear that online learning is “not full-value” education. However, most often, the poor results of distance learning are the consequences of poor organisational management. Not only do technology and

learning models need profound transformations, but so too does educational management.

The Corona-crisis revealed gaps in digital readiness', which impeded the transformational process, and caused the existing practices to fail. This affected KNEU competitiveness rankings. We believe that identifying these hazardous areas will be useful for it and other universities when working on their preparedness for digital transformations. The following direction is suggested by the analysis:

1. Teachers' digital skills and their motivation for self-development
2. Democratisation of learning, the reduction of authoritarian dominance in teaching
3. Greater responsibility of teachers for the quality and balance of learning, balanced attention to all courses and years, and increasing teachers' and learners' responsibility for the online learning outcomes
4. Control and coordination of teachers' and students' workload, attention to their mental and physical health
5. Practical orientation for training and the quality of the corresponding methodical materials
6. Ongoing modernisation of multifunctional digital infrastructure at university.

Only energetic and radical transformations in these spheres, in our opinion, can help universities to prosper in this new era of education.

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3.3. CASE STUDY 3. OLGA VINDAČA & VELTA ĻUBINA

Digital Transformative Learning in the Context of Higher Education Following Covid-19 in Latvia

This sub-chapter draws attention to digital transformative learning in the context of higher education following Covid-19, based on the research conducted online among students and educators of Latvian higher educational institutions. The research has been developed within the scope of the project "Implementation of Transformative Digital Leaning in the Doctoral Program of Pedagogical Science in Latvia" ((DocTDLL) Izp-2018/2-0180) and covers the Latvian experience and the problems faced within key aspects of digital transformative learning in the context of higher education, specifically identifying the importance and readiness for Covid-19 situation and highlighting its challenges, possible solutions and recommendations.

3.3.1. Background and Contexts

The World Economic Forum has been observing the influence of the Covid-19 pandemic in detail covering the educational field as well. This has revealed that higher education has gone through tremendous change during Covid-19 pandemic, but institutions that have invested in digital technologies are proving to be more agile and resilient, despite the fact that the education system has made a significant shift on all levels and may never return to the previous model (World Economic Forum, 2020). The Covid-19 pandemic has highlighted the necessity to make higher education more flexible (Martin, Fuliv, 2020), corresponding to the changes (Mitchel, 2020), reshaping using hybrid learning and new challenges (Currie, 2020), digitalizing learning process (Dennis, 2020). Apart from resources, staff readiness, confidence, student accessibility and motivation are all important parts of digital learning (Ali, 2020).

Digital learning or e-learning have not been new terms in higher education for the last two or even more decades. The definition of digital learning has been enlarged, as it is not only a learning system based on formalised teaching with the help of electronic resources, where the use of different electronic devices and the internet form the key components, but with the rapid progress in technologies and the advancement in learning systems, it is now embraced by the masses (The Economic Times, 2020). Therefore, the key issue is how to use it in the study process in higher education to enable students to learn better either through interactions with the educator, each other or independently (Brenton, 2009). The Covid-19 pandemic has accelerated and widened the digital learning perspective, but were students and educators ready for such rapid transformation? What have been the key aspects for further improvement and change?

The following trends in digital learning were identified, by education professionals, before the state of emergency: the need for effective professional development; digital learning has to be an integral part of teaching/learning strategy; the opportunity of social networking; the increase of digitalisation (Davis, 2020). These key trends later became the reality within which the transformation of the study process took place.

Transformative learning theory was first publicised almost 40 years ago by Jack Mezirow, and as adult learning theory, it helped to explain how adults changed the way they interpreted the world, while learning is understood as the process of using a prior interpretation to construct a new one or to revise the interpretation of one's experience to guide future action (Mezirow, 1991). This idea was later extended by proposing that the transformative process is formed or limited by a frame of reference, in which frames of meaning are meaningful structures that include assumptions and expectations that shape an individual's tacit views and influence their thinking, beliefs, attitudes, and actions.(Taylor, 2008). This transformative learning theory is actual for the current pandemic situation. Meanwhile, Cranton has indicated that there are no teaching methods that guarantee transformative learning, still a challenging environment may be the common feature that underlies teaching for transformation (Cranton, 2006). Additionally, the internet has been named as a transformative technology that is changing the way we do things and allows us to do things that we could not do before (Brenton, 2009). The question is what exactly should be transformed in the study process, when pedagogy, content and technologies come together. The solution offered by Ruben R. Puentedura describes the alternative discourse for the education transformation, the so-called SAMR model moving from enhancement to transformation. It is used in a wide range of fields, but when it comes to higher education it starts with a process of enhancement including firstly, substitution, when the direct tool is substituted by another without functional changes, and secondly, augmentation, when the direct tool is substituted by another, but with functional improvements. Afterwards, moving on to transformation, which involves, firstly, modification, redesigning of tasks and secondly, redefinition and the creation of new tasks (Puentedura, 2013).

How the original SAMR model describes the discourse from the enhancement to the transformation. In the case of the Covid-19 pandemic the same model, with the alternative discourse offered by Uvarov, closely correspond to the challenges of current situation (Fig. 3.3.1).

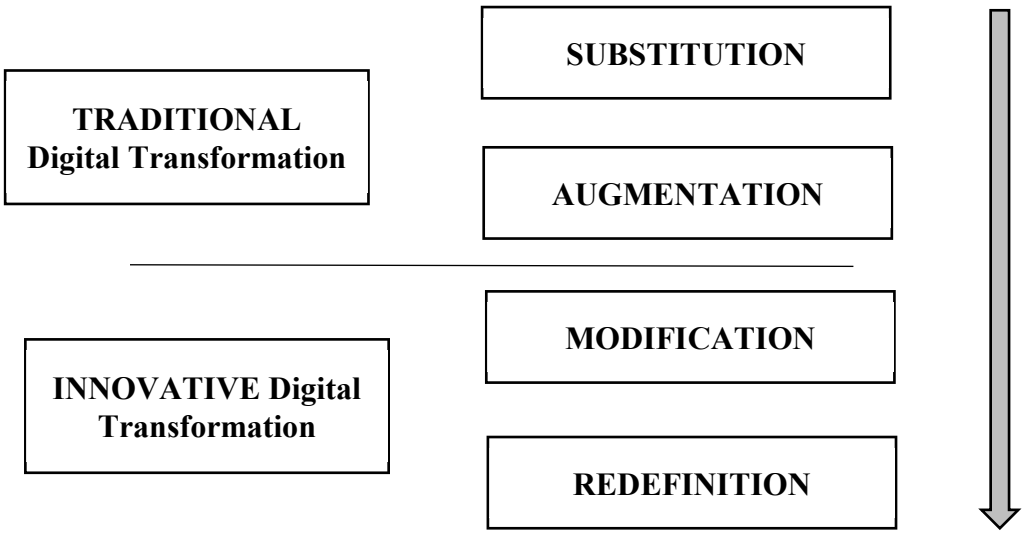

Figure 3.3.1 *SAMR Model with Alternative Discourse (Uvarov, 2019)*

According to Fig. 3.3.1 substitution and augmentation are indicated as traditional digital transformation aspects, while modification and redefinition are the innovative ones. Uvarov has changed the placement of model key components, but the sense of the model kept unchanged. Before the Covid-19 pandemic, there was enough time for a slow transition towards educational transformation, but afterwards the process was speeded up. Therefore, for the situation analyses, the traditional components of education should be replaced by innovative ones, the key aspects should be expanded and modified.

The digital transformation of education can be defined as the systematic updating of the following: firstly, the required educational outcomes, secondly, the educational content, thirdly, the forms of organisation of the study process, fourthly, the methods and approaches used, and finally, the evaluation of the results achieved in a rapidly developing educational environment (Uvarov, 2019). Thus, the Covid-19 pandemic, by highlighting the necessity for digital transformational learning, has generated a challenging environment within the context of higher education, as it required the transformation of learning into wider digital learning opportunities.

Additionally, the concept of digital transformation as offered by Alcatel Lucent focuses on the necessity of specific strategy development for the educational institution. A clearly defined strategy takes advantage of the opportunities offered by new technology while meeting the objectives of the stakeholders. However, in order to develop such an educational strategy, the following steps are needed: to connect everything - creation of high-capacity communication networks; use of analytics to automate, understand and save money; the need to use real life, real-time data to drive strategic initiatives that improve performance, upgrades and infrastructure decisions; to update models, software and services on demand, making them cheaper, more

flexible and easier to manage; to create a single platform as the basis for the institution's network and communication infrastructure(*Alcatel-Lucent, 2018*) (see Figure 3.3.2).

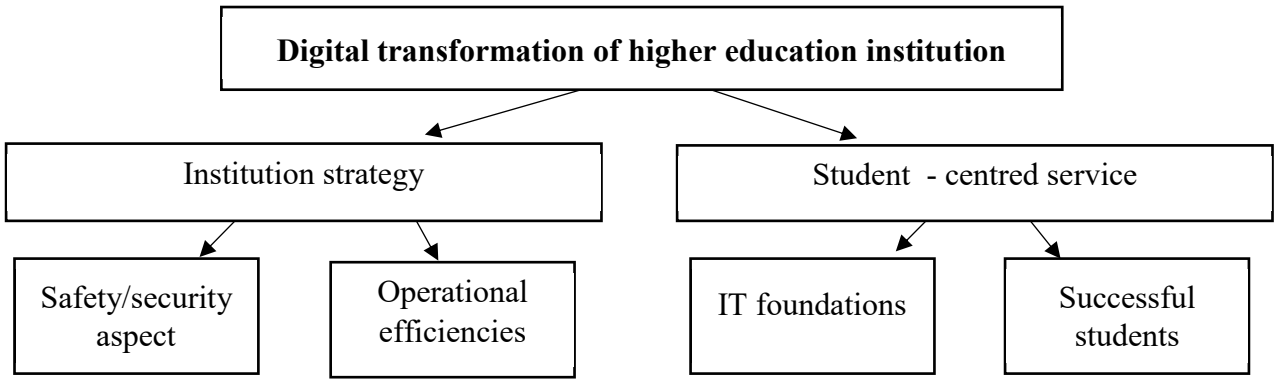

Figure 3.3.*2 Digital Transformation of Higher Educational Institution (Alcatel-Lucent, 2018)*

According to Figure 3.3.2 the key factors of digital transformation in the context of higher education institutions are an effective strategy and provision of student–centred service. A rethinking of the use of digital tools for new levels of collaboration, innovation and endless learning possibilities is, therefore, highly recommended (*Alcatel-Lucent, 2018)*.

Digital transformation requires the development and improvement of additional competences, focusing especially on digital one. The current study is based on DigComp 2.1 framework (Carretero, Vuorikari, Punie, 2017), where the proficiency levels are identified, explaining the examples of use in learning aspect.

3.3.2. The Latvian Case Study: Design and Results Matching

The following theoretical contexts were used in the development of the online questionnaire: digital technologies have transformed the study processes of higher education institutions by providing new challenges and advantages associated with a technology-rich environment, focusing on the concept of skills and competence development and effective human-computer partnerships.

The quantitative data has been collected focusing on four specified aspects: the study environment, organisation of the study process, competences and IT-human dialogue. The second part proffered the solutions suggested by respondents to open-ended questions, providing qualitative data.

A total of 93 respondents from higher education institutions in Latvia participated in the research. By analysing the general data about the respondents involved, the following indicators have been established: gender, age, location and occupation. The majority of respondents have been women 65%, while men made up 29%. The age of

respondents has been from 18 to 62, while the majority of these, 31 respondents (33%), have been in age range 18-25. Concerning the location, the majority of respondents have been from the Latgale region – 71 respondents (76%). The Zemgale and Vidzeme regions have been presented as well. 11 respondents have been from Riga. There have been 23 educators and 67 students, who are representative of different study programs: at Bachelor's, Master's and Doctor's level. Students and lecturers have represented three study fields: Engineering, Social Studies and the Humanities.

The analyses of the questionnaire have been structured according to the specified aspects, including a separate one for the open question section.

The first specified aspect was the Study Environment, as the study process has been moved from a traditional to a hybrid and online one. Respondents have specified their level of agreement or disagreement using a Likert scale for both the Importance Index and the Readiness Index. The scale for the Importance Index was from unimportant (1) to very important (5), while the Readiness one from never ready (1) to always ready (5). The aspect of the Study Environment included five statements of ICT supply, malfunctions and e-environment. Overall, for all of the specified statements, the rating has been higher to the Importance index in comparison to the Readiness one. (Fig. 3.3.3).

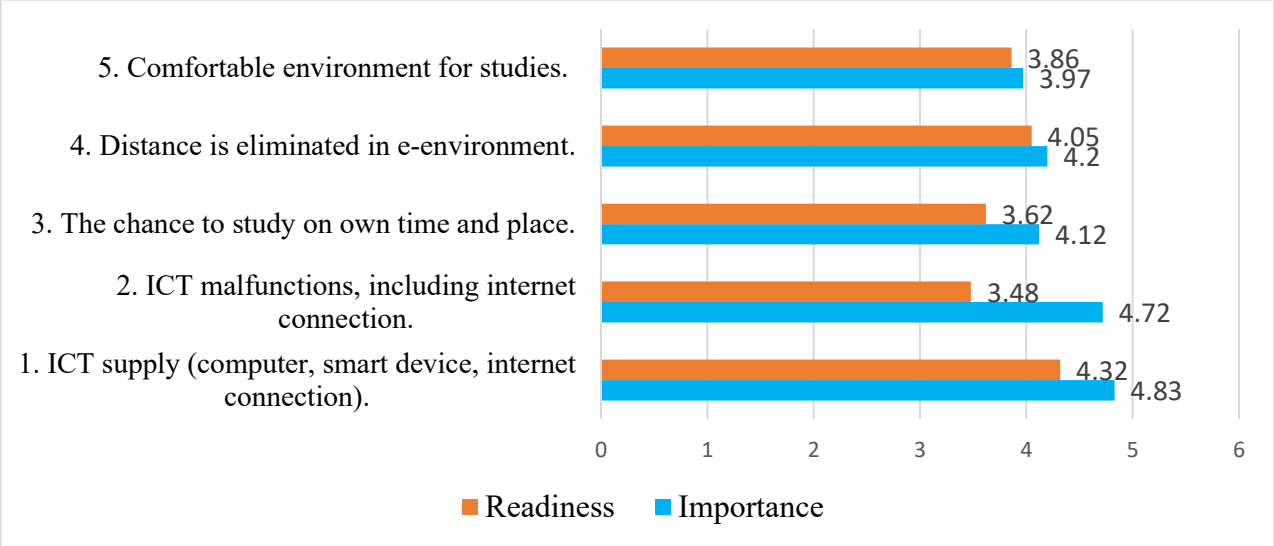

Figure 3.3.3 *Importance and Readiness Indexes for I. Study Environment*

The average for the Importance Index is 4,37, while for the Readiness – 3,87. The highest Importance Index is for statement Nr.1 – ICT supply (computer, smart device, internet connection) -4,83, while the lowest Importance Index is for statement Nr. 5 – Comfortable environment for studies – 3,97. However, the highest Readiness Index is also for statement Nr. 1, while the lowest for ICT malfunctions, including internet connection. The comparison between the Importance and Readiness Indices allows to

evaluate the most important aspects of study environment that are necessary for effective learning process affected by Covid-19.

Another important aspect has been the Organisation of the Study Environment, taking into consideration the changes that they faced. The second aspect included 9 statements. Similarly, to aspect Nr.1 the Importance Index is higher for all statements than the Readiness Index (Fig. 3.3.4). The average for the Importance Index is 3,93, while for the Readiness Index is 3.38. The highest Importance Index is for the statement – that online learning/teaching gives possibilities for unlimited study resources (4,34), while the lowest Importance Index is for promotion of collaboration in an e-environment (3,61). However, the highest Readiness Index is for the offer of different communication options (3,71), while the lowest – efficient learning of information (3,13). Moreover, the highest difference between the Importance and Readiness Indices is for the statement that the individual study approach is ensured (the difference 0.81), while the lowest difference is for several statements: the opportunity for creative work (0.41), offering different communication options (0.40), and, promoting collaboration in an e-environment (0.41).

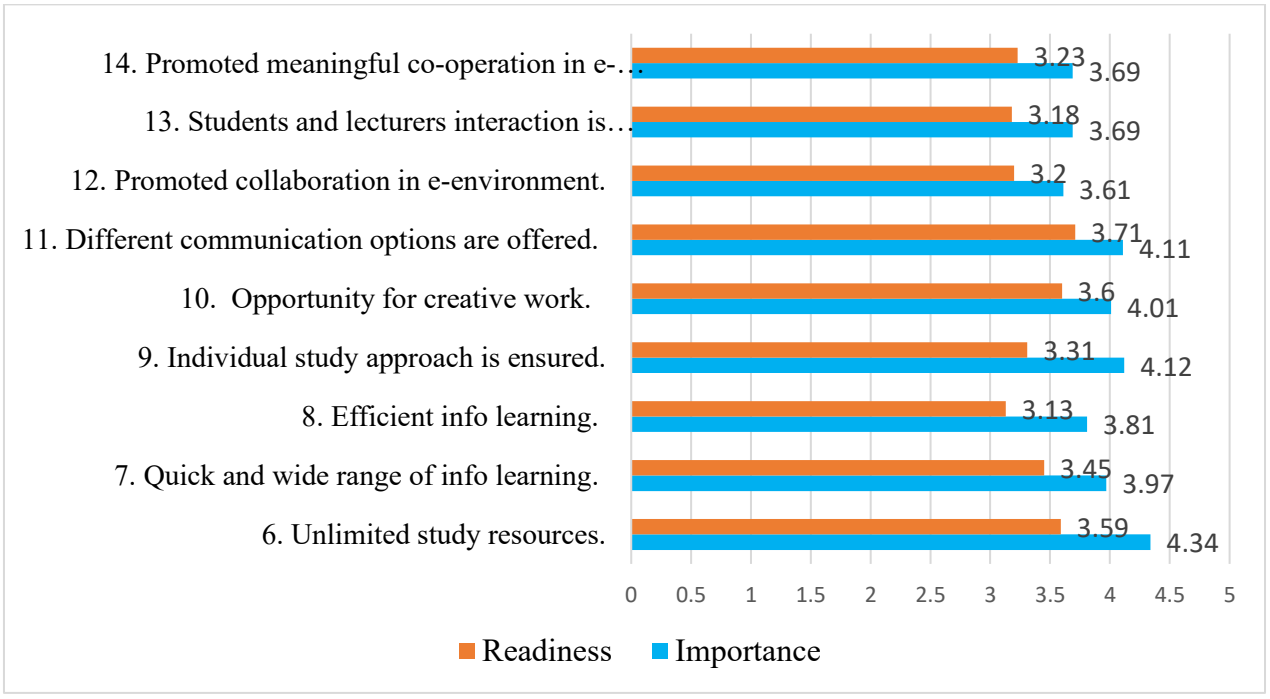

Figure 3.3.4 *Importance and Readiness Indexes for II. Organization of Study Process*

The next specified aspect was Competences, including ICT and communicative competence, problem-solving skills, info selection and critical evaluation skills, student's self-management skills and new knowledge and skills development based on previous experience, a total seven statements. The focus was on a student-centred/inquiry-oriented approach. The average for the Importance Index is 4,39, while for the Readiness Index is 3,73. Overall, the Importance Index for all specified

competences has been near to average or even higher (Fig. 3.3.5). The highest Importance Index is for the statement about student self-management skills of the study process, while the lowest index is for the statement about developing communicative competence. However, the Readiness Index is lower for all specified competences in comparison with the Importance Index. The highest Readiness Index is for several statements – info critical evaluation (3,82), problem-solving skills (3,8) and info selection skills (3,8). The lowest Readiness Index is for the same statement that is indicated as the most important – the student's self-management skills during the study process.

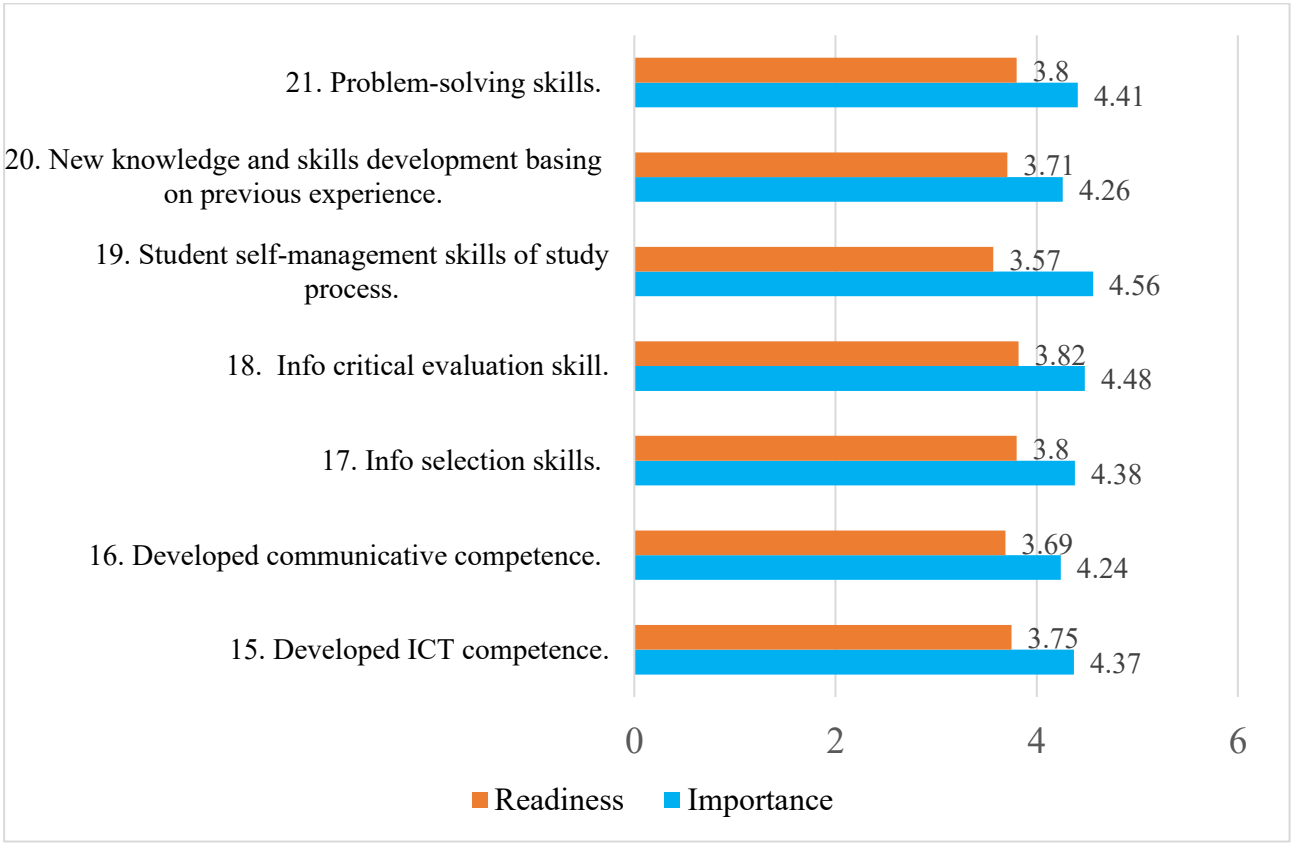

Figure 3.3.5 *Importance and Readiness Indexes for III. Competences*

The last specified aspect has been Information Technologies and Human Dialogue or interaction. This aspect has included seven statements necessary for effective human-computer partnerships. The average Importance Index for the fourth aspect is 4,11, when the Readiness Index average is 3,56. The Importance Index is higher than the Readiness Index for all seven statements, similar to the previous three aspects (Fig. 3.3.6).

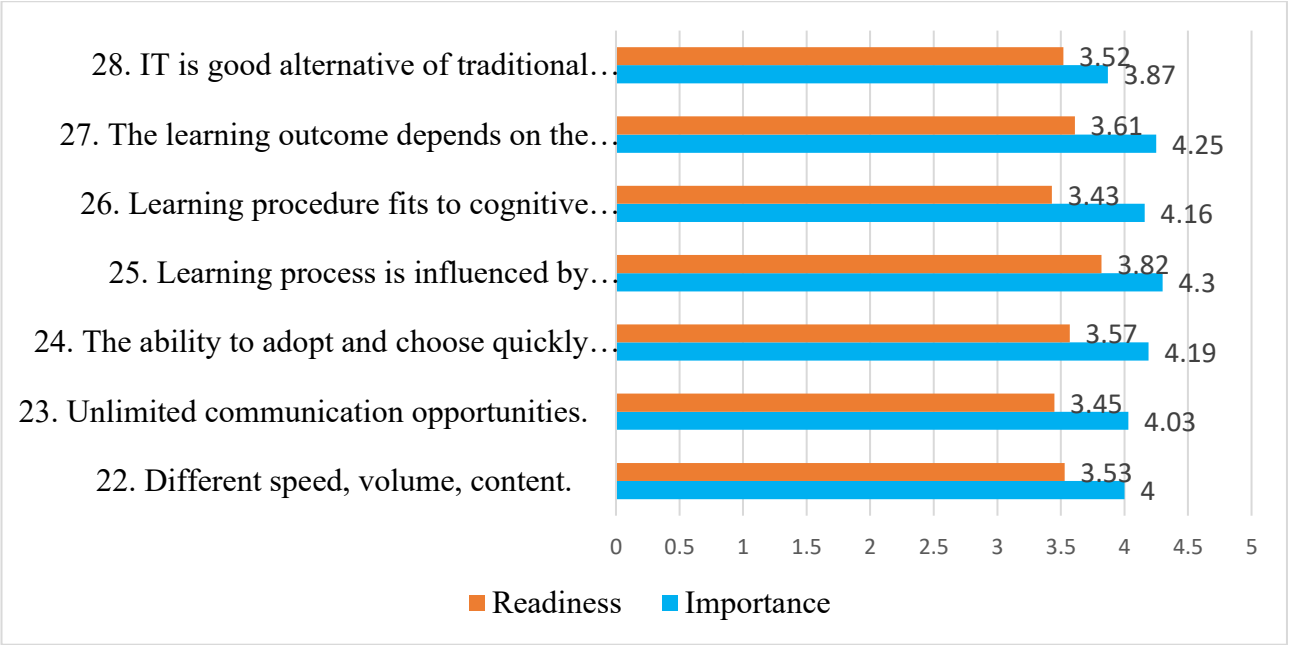

Figure 3.3.6 *Importance and Readiness Indexes for IV. IT-Human Dialogue*

The highest Importance Index is for the statement that the study process is influenced by the technology (4,3), while the lowest index is for the statement that IT is a good alternative to traditional forms. The highest Readiness Index is for the same statement, as is the most important one, that the study process is influenced by technologies, while the lowest Readiness Index is for the statement that the learning procedure fits the cognitive process and digital technologies (3,43), the same statement has the biggest deviation between the Importance and the Readiness Indices.

The results of the case study have proved the expectation that the Importance Index is higher than the Readiness Index for both the statements and aspects. That means that the respondents understand the importance of the potential of digital technologies and online/hybrid study environments for educational innovation, while they were not ready for the rapid transformation, which followed Covid-19, requiring further detailed research directed at inquiry-oriented and learning-centred study processes.

3.3.3. Integrating Statistic Data

SPSS Statistics has been used for further data analysis, comparing respondents by the following indicators: gender, age, occupation.

Firstly, for each specified statement gender priorities have been analysed through the Mann-Whitney Test. For Study Environment aspect women showed a higher significance index for four offered statements, with the exception of the statement about a comfortable environment for studies. While for the Readiness Index women rated ICT supply, ICT malfunctions and distance elimination as higher, whereas men

rated comfort and study in their own time and place as higher. Moreover, by analysing Aspect II. Organisation of the Study Environment, it is clear that the Importance Index is higher for women in almost all statements except for efficient info learning, where the Mean Rank is similar (men - 43,74; women – 44,12), while the Readiness Index is higher for women for all statements, except for the quick and wide range of info learning. However, the importance of five competences of the seven is rated higher by women, while both men and women rate info selection and critical evaluation skills in a similar way, whereas the Readiness Index does not have the same even distribution in its ratings as ICT, communicative and transformative skills are rated higher by women, while info critical evaluation and student self-management skills – by men, with info selection skill and problem–solving being rated similarly by both groups. Finally, the Importance Index for IT-Human Dialogue is higher for women, except for the statements: IT is good alternative of traditional forms and unlimited communication opportunities. The Readiness Index is higher for men in terms of speed, volume, content, the influence of technologies on the learning process, learning model selection and IT as a good alternative to traditional forms, while for women it is higher for learning procedures in accordance with cognitive processes and digital technologies and the ability to choose technologies with unlimited communication opportunities.

Secondly, for each specified statement, the priority by age group was determined through the Kruskal –Wallis Test. As it has been indicated previously, the age range of respondents was from 18 to 62. All respondents were clustered into five groups for further analyses: 18-25; 26 – 35; 36-45; 46-55 and 55 and above. As for the highest indicators for the Importance Index and for some statements of the Readiness Index, they are noted in the age group of 26-35. Additionally, for many offered statements the Importance and the Readiness Indices have been rated equally in this age group. For instance, the Importance and the Readiness is highly rated by this age group for the following statements: distance elimination, quick and wide range of info learning, efficient info learning, ensuring individual study approach, creative work opportunity, different communication options, promoted collaboration, students' and educators' interaction, promoted co-operation and IT as a good alternative for traditional forms. Moreover, the rating of competences is higher in the 46-55 age range, especially for the Importance and Readiness of the following statements: info selection and info critical evaluation and problem–solving skill. However, there is no specific iteration by age groups for the statements within IT-Human Dialogue.

Thirdly, regarding occupation, the respondents were divided in the following groups: Students of Bachelor Program, Students of Master Program, Students of Doctor Program and Educators. The general analyses of two separate groups: students and educators have been made using the Mann-Whitney Test for all 28 statements, including the Importance and the Readiness Indices. The analysis of the Importance Index shows that half of the statements (15) were rated higher by educators than by

students, while for the Readiness Index 18 statements were rated higher by the students than the educators. The following statements, were rated equally by the educators and students: eliminated distance, unlimited communication opportunities and the dependence of learning outcomes on the selection of learning models.

Using the Kruskal-Wallis Test, detailed analyses were provided for the wide range of respondents' groups: Students of a Bachelor's Program, Students of a Master's Program, Students of a Doctoral Program and Educators. A specific discrepancy has been identified: only three statements are rated higher by the educators for the Importance Index: info selection and critical evaluation skills and different speed, volume and content. While for the Readiness Index educators have rated higher ICT competence, developed communicative competence, info selection and info critical evaluation skill. The majority high Mean Rank for both the Importance and Readiness Index is from Doctoral Students. While for Students of a Bachelor's Program, the most important in terms of comparison with other groups, has been ensuring the individual approach.

As there was no specific assignment of respondents by location, this parameter hasn't been used for the detailed analyses. The study field aspect, however, has been compared. The respondents from Humanities field have the majority of highest ratings. However, for respondents from Engineering field, the highest Readiness Indices are for ICT malfunction, unlimited study resources, student self-management skills and IT as a good alternative for traditional forms. Moreover, the respondents from Social Studies have a high Readiness Index only for different communication options and interaction between lecturers and students.

3.3.4. Generalising the Importance and Readiness Indices

The analysis of Aspects has identified specific findings for the following, study environment, organisation of study process, competences and IT-human dialogue. The findings of Aspects analyses are shown in Table 3.3.1.

Table 3.3.1 *Aspects analyses*

Aspects	Importance Index	Readiness Index	Difference
I. Study Environment	4,37	3,87	0,5
II. Organization of Study Process	3,93	3,38	0,55
III. Competences	4,39	3,73	0,66
IV.IT-Human Dialogue	4,11	3,56	0,55

Preliminary data from the statements has shown that the Importance Indices are rated higher than the Readiness Indices, respectively the Importance Indices of the four analysed Aspects are higher than the Readiness Indices. This is especially true for the specific deviation found between the Importance and Readiness Indices for Competences. So, respondents have appreciated the importance of this aspect, but they were not ready for such a rapid digital transformation. In order to measure the strength of any association between two variables, Kendal's correlation has been utilised. The correlation for all four aspects of the Importance Index is weak (.280 - .378): Study Environment, Organisation of Study Process, Competences and IT-Human Dialogue, while the correlation of all four aspects in the Readiness Index is higher, but still weak (.316 - .497), so the four aspects do not have high correlation for either Importance or Readiness. The findings show that the four aspects are also not correlated by gender, place, occupation and field, while the weakest correlation (.269) is observed for Competences and Age within the Importance Index.

3.3.5. Qualitative Data Detailing

In addition, for the transformation of study to be successful following Covid-19, an open-ended question was asked allowing for analysis of the respondents' suggestions and proposals. Overall, 19% of respondents were satisfied with the online teaching/learning, while based on the detailed analyses of the open-ended question the following recommendations have been indicated:

1) ICT supply, malfunctions, internet connection should not influence the study process, so it should be properly provided, for students and educators;
2) Online learning can be combined with traditional (face-to-face) learning (theory–online; practice–traditional);
3) Despite the fact of unlimited study resources, the possibility of an individual study approach and various communication options, these have not been fully used, as this requires additional resources (time and labour), so this must be taken into consideration.
4) Self-management skills of students need to be improved, along with ICT competence and communication competence for students and educators, and the required courses to achieve this should be organised and offered;
5) ICT competence needs to be improved constantly, in order to evaluate the possibility of adding a special course to any study program regardless of the field;
6) The creation and usage of a unique system for organisation of online learning/teaching processes within one institution, informing all of those who may be concerned.

Thus, the digital transformation following Covid-19 has been a trigger for changing traditional study processes, changing teaching/learning processes, changing study environments, and time is needed to clearly understand and analyse how to respond effectively to the challenges to be faced, taking into consideration the speed and scope of the digital transformation process, the technology-rich environment and the concept of skills and competences, especially the development and improvement of digital competences.

3.3.6. Conclusions and Recommendations

This case study leads to the following conclusions:

1) The identification of background knowledge and skills is highly recommended, using regular assessment and analysis for planning further development for students and educators;
2) The Covid-19 pandemic has moved teaching/learning to a technology-enhanced/ technology-rich study environment, therefore corresponding ICT solutions have to be offered, including addressing ICT supply, malfunctions, internet connection, to ensure a proper learning process from the perspective of both students and educators;
3) Any further work in education should consider blended learning, including flipped, hybrid and hyflex learning, combining offline and online solutions for effective learning process in a new study environment (technology-rich);
4) Despite unlimited study resources, individual study opportunities, student-centred or inquiry-oriented approaches, different communication options and digital tools, support at an individual, institutional and national level needs to be assessed, as it requires additional resources, specifically time and labour and this should be taken into account in future research;
5) The core competences, such as the self-management skills of students, ICT competence or digital competence and communication competence from both the students' and educators' perspective needs to be improved and strengthened, by organising and offering corresponding courses in a life-long learning context;
6) The key proposition is that pedagogical digital competence should be considered in the discourse of life-long learning, covering the most popular ways of learning: distance, online, remote, web-facilitated, blended as traditional pedagogy has been deflected to the smart pedagogy of the digital age;
7) Further research requires a detailed analysis of the Readiness index for the indicated key Aspects: study environment, organisation of study process, competences and IT-Human dialogue, to highlight progress following the

challenges of the Covid-19 pandemic, where special attention is paid to the study process components (student/educator/content) within the new external and internal environment;

8) It is recommended that there is an acknowledgement of the unique system for organisation of transformative digital learning at a individual, institutional and local authorities' level, along with providing a framework and guidelines, informing those who may be affected what and why something should be implemented, to ensure effective transformative digital learning by implementing systematic and regular self-assessment and evaluation procedures, data analyses, research and planning.

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3.4. CASE STUDY 4. IRĒNA ŽOGLA
Creating the Educator-Doctoral Student Partnership in Research

3.4.1. Invitation to Learning and Research Partnership

Thanks to Dr. Todd Blayone (Researcher at the University of Ontario, Institute of Technology, EILAB) who had agreed to undertake the obligations of the senior researcher in the DocTDL project and provided a possibility to get acquainted with the investigation of digital transformative learning run by the Educational Informatics Laboratory (EILAB) at The Ontario University, Canada, and meet Director of the EILAB, the program Director of the BA in Educational Studies and Digital Technology, Associate Professor Roland van Oosteveen who kindly shared the experience of the laboratory and his individual experience of acquainting students with the theoretical position of a scientific advisor and curriculum designer to form educator-student research communities.

Dr. Roland van Oostveen has kindly allowed use of the welcome *Promotional Application* prepared by him (Roland van Oostveen. Promotional Application. https://docs.google.com/document/d/1asn_I9_2asDy1zGkhNYa9WOje_CKy6vSi47Lfqmz5ZY/edit) that informs students about his basic philosophical approach and the leading theoretical principles that students need to identify for successful research and creation of new knowledge and skills. This idea and the *Promotional Application* are used in this chapter while educators and doctoral students can use more of these when visiting the above given site.

Doctoral studies represent the highest stage of formal education; doctoral students are autonomous to investigate issues, define research problems, synthesise the basic theories underlying the investigation, select compatible research instruments, complete the investigation, and to present the findings to demonstrate their doctoral competence. The Universities of Latvia call on the scientific advisors to allow the doctoral students to form the theoretical basis of the research, to identify the relevant literature and to choose the research methods. The educator assistance is necessary for the doctoral student to perform correct theoretical analysis and data processing so that the theoretical generalizations are sufficiently substantiated and the research can be qualified as a doctoral student's independent research.

Nevertheless, doctoral students need some induction to their studies and research. One of the forms is a short introduction to the research field to accentuate what has been done before and what are the preferable approaches in modern doctoral research in education. At the previous stage of the development of pedagogy (instructionist, normative) educators used to tell students what to take into consideration, how to create a theoretical underpinning, etc.; what one is told, usually is easy to forget – more effective is guidance-by-doing.

It is prudent to inform students about the pedagogical experience and philosophy of their educators, especially their scientific advisor, including his/her competence in the subject area, skills related to digital technologies in research and education, research and social activities, as well as education and professional activities within and outside of the institution, his/her degrees and academic position, research interests and their implementation, publications, participation in projects, international activities like conferences and activities in professional/researcher international associations, further learning and professional fulfilment, etc. This information is usually stored in official documents, the CV and project descriptions; meanwhile students, even doctoral students, are poorly informed about the educators' profile, something which is extremely valuable for cooperation and partnership.

One can argue that in the program/curriculum, the academic studies section introduces the possible research ideas, usually through the suggested courses and a special course of study or methodology on research.

Yes, this is true, but practice emphasises the need for doctoral students to have a kind of a written summary that is contextualised for their specific individual choice. If this is provided in a written form and deals with the specific scientific advisor, this introduction will allow for returning to this advice and the educator's philosophical thought once more. Particular attention should be paid to the use of past research experience. This is undoubtedly important, but very often, if not always, it needs to be placed in the new, currently influential context that is appropriate for the new environment, in order to determine the historical contribution. The DocTDL project team considers this experience valuable and recommends that scientific advisers of doctoral research in education prepare personal introductory information about their pedagogical and research philosophy as a model for a successful partnership for completing the doctoral program in Education Sciences (licenced in May, 2020). See: https://www.lu.lv/studijas/fakultates/pedagogijas-psihologijas-un-makslas-fakultate/doktorantura/izglitibas-zinatnes/; or https://www.rta.lv/rta_istenotas_studiju_programmas.

Such introductory information is especially valuable for the implementation of a joint program by four Latvian universities entitled "Educational Sciences" with a theoretical background in pedagogy as central (see the classification of sciences provided by the Council of Sciences (https://likumi.lv/ta/id/296661-noteikumi-par-latvijas-zinatnes-nozarem-un-apaksnozarem). The DocTDL project team proposes some conclusions that may help to construct a theoretical background and pedagogical philosophy to underpin the research, in particular through the transformative digital learning priorities and thus the transformation of the educational process under study.

A long-lasting transition to a learner-centred process in the digital age seems to be clear, yet complicated and not finished because of the gaps between theory and practice, research sciences and creative implementations of pedagogical innovations,

as well as between general educational theories and practices of teaching different disciplines that are caused by the ever-changing social arena and digitalisation, which in their turn cause misunderstanding and even myths; all this require constant investigation. The massive introduction of digital technologies transforms learning and pedagogy even at the doctoral level that, hopefully, provides deep learning and makes educator-student cooperation in partnership less time-consuming.

Educators and "teachers do not direct the learners but rather they act to facilitate learning" (van Oostveen, Childs, Clarkson & Flynn, 2016). They help to create 'a digital sandbox' for cooperative learning (Van Oostveen, DiGiuseppe, Barber, Blayone, & Childs, 2016), and democratise fully online learning (Blayone, vanOostveen, Barber, DiGiuseppe, & Childs, 2017).

Programs/curricula even if based on *The New Learning Theory/Science* integrated with *Computer Sciences* and are oriented to the learner good digital skills, are still highly dependent on the educators' pedagogical philosophy and its implementation in the educational process – the question of 'how' the process, from cycle to cycle is designed and organised determines the quality of 'what' students will achieve. Therefore, pedagogical models that do not keep pace with modern knowledge of how people learn in a digital environment will fail being based on implicit and very limited concepts of student autonomy in learning and targeted facilitation by educators. Doctoral students will find here several topical problems to be investigated.

When teaching-learning activities occur within a previous normative approach in the learning environment, much of higher education, including the newly adopted doctoral program in education (in Latvia), still might remain based on predominantly content and the delivery of conceptual and methodological information by educators – pedagogical innovations will not take place until there is no change for "doing with understanding" rather than "doing for the sake of doing" (Barron & Darling-Hammond, 2010, 202).

Even the latest conclusions published by researchers (Blundell, Lee, & Nykvist, 2020) state that there is still little evidence of wide-scale transformation towards creating learning environments that help doctoral students to become self-directed learners. One could argue that the pandemic has made educational institutions change the mode of teaching-learning to online or hybrid classes with high learners' autonomy. Nevertheless, transforming modes of learning is not enough if these allow for a fractionated way of learning, if the transformation is not coupled with balancing and integrating the learners' cognitive, emotional, and social development during learning, in particular an effective learning culture and experiences that need time to develop and maintain.

Constructivist (knowledge building or creating) learning includes many different sets of premises and theories to highlight the fundamental concept that humans create their own understanding by constructing it using new information and their

experiences. Consequently, constructivist learning opportunities, by their nature, are learner learning-driven and process-centred. Employing *The Activity Theory*, we accentuate moving the focus from the learner to the learner's learning. Collaborative teamwork and even partnerships are required, thereby creating opportunities to capitalise on the development of social and other skills, shaped by access to a diverse variety of perspectives, which are helpful when formulating problems and solutions to those problems. Students or learners in learner learning-driven environments, online or co-located, are responsible for their own learning and the best evidence of such learning is the students' questions, discussions, dialogues, and testing of new ideas to build a deep understanding of concepts, as well as the processes of knowledge and skills' creation used to assist learning.

The transition to a learning-driven process from a learner-centred one is essential and means moving the object of research and facilitation from instructing learners, story-telling, urging, demonstrating, reminding, etc., towards creating a learning environment where learners construct or design their learning/research according to their experiences and prior knowledge, and by doing so, create new knowledge, develop their skills, and improve their attitude. The DocTDL researchers, along with specialists in *The Complexity Theory* (like Turner, & Baker, 2019) suggest focusing on *The Complexity Theory* to form a theoretical basis for doctoral research in Educational Sciences, especially pedagogy, which is inherently a complex phenomenon.

It is clear that the process may remain limited to the content, as it is determined not only by the pedagogical philosophy of the educator in practice, but also by the readiness of doctoral students, prior knowledge and their skills to be able to learn in partnership, maintain dialogue, or initiate new ideas. The educational process, its design, organisation for learners learning new knowledge, skills and attitudes is a priority, it is what constitute pedagogy itself, while the content and educator support function as well-coordinated pedagogical tools. The structure of a pedagogical process elaborated by several colleagues has been published (Žogla, 2017; 2018a; 2018b).

The program itself still carries a risk and might even become a weak link when compared to the pedagogy of its implementation. Indeed, a well-designed program might remain primarily educator-driven or content-centred. Even the online and hybrid-format studies and tutorials introduced by the pandemic might have limited positive effects, because these have been transitioned from the traditional experience of face-to-face classes, by incorporating the use of digital technologies in a physically co-located learning environment. Researchers (Van Oostveen, Childs, Clarkson and Flynn, 2016) have concluded that study courses easily can be organised as educator-driven e-environments because the educator, in making most of the educational choices, is responsible for the delivery of the course content to the students and for modelling appropriate learning behaviours, typically stressing memorisation, comprehension and application.

Such a process can be illustrated as students' jump from the aim to the 'result' or 'outcome' (both notions are general and actually say nothing without a clear vision of the learners' achievements) instead of the process of gaining the desired success. The preparation of doctoral students for each online and hybrid class becomes central: students have to read and analyse the suggested or chosen issues to be ready for inquiry-based learning that should consist of reasoned discussion, problem-solving, suggesting new ideas, and other activities; otherwise, informative story-telling and instruction will fill in the gap that always appear when students have not prepared for the online class.

Learning is defined comprehensively encompassing not only memorisation, comprehension, and analysis, but above all synthesis, evaluation and creation. In a constructivist scenario (other synonyms: pedagogical process, design), learning uses its potential to be active and it occurs in the context of real world-based situations, which emphasise the learners' abilities to perform tasks in collaboration with educators, peers, and other researchers. Assignments and tasks must be assessed in authentic ways: emphasis should be on self-evaluation and peer evaluation while educators remain experts in evaluating the quality of program acquisition.

Coherence between curricula, educators' advice, and assessment could be better achieved if learning, the subject matter, and the educator's assistance were all derived from a scientifically credible and shared knowledge base about cognition and digitally supported learning. The model of learning would provide the central bonding principle, serving as a nucleus around which the learner, educator, and the subject matter function for the benefit of learner proficiency. *The New Learning Theory/Science* informed by *Neuroscience* and *Computer Sciences* accentuates recent findings in how learners learn, how learning happens, and why learners achieve the desired quality (or under-achieve). This serves as the theoretical basis for partnership pedagogy, creating a complex learning environment to support successful learning and self-development.

3.4.2. Pedagogical Process as Part of Learning Environments

Digital learning loosens the boundaries of formal and informal learning changes where, with whom, and when one learns, as well as shifts priorities by strengthening the role of assessment. The educator and student activities, the content, articulated theoretical positions, educational and pedagogical philosophy that is implemented through organised and facilitated learning and research, selection of traditional and digital tools, as well as maintaining relationships all create a learning environment. Digital technologies have introduced shifting from learning by fractioned using of digital technologies to learning with digital technologies and digitalization of pedagogical processes.

Digitalisation of learning describes the process by which education and training, and generally skills acquisition, development and recognition, are being transformed by the use of digital technologies (Williams, 2018; Beblavý, 2019).

The belief of David H. Jonassen (in van Oostveen's *Promotional Application*) is that constructivist instruction is an oxymoron (a figure of speech in which contradictory terms appear in conjunction) accentuating some of the peculiarities of teaching-learning. Consequently, teaching in its many forms can be understood as a set of processes that initiate the creation of a physical or virtual environment within which learning can occur. The first such conjunction appears when brain (a physical matter) functioning produces mental outcomes. One more conjunction appears when individual mental processes meet interferences of social and nature environment receiving strong stimuli from them.

The Computer Sciences and *The Neurosciences* have changed the understanding of learning, and in turn have changed also teaching and, consequently, internal links between learning, teaching, and the subject matter that integrate in the form of pedagogy. This integration is demanding of the learning environment organised by the institutional pedagogical process (in many sources it is called 'design'). The creation of the environment takes place between such important factors as learner prior experience and the impact of external factors, learner autonomy and their need for their educators' assistance, cognitive and emotional support. The mission of pedagogy is to integrate impacts of the external environment, create an appropriate internal environment (design of pedagogical process) for learner learning and development, as well as encourage wide usage of external environment to create new knowledge, skills, and other appropriate qualities for life and further learning.

3.4.3. The Educator's Personal Experience

Beliefs about the appropriate pedagogical process at doctoral level, for instance, the aims and process (design) of doctoral studies, should be discussed in details with the doctoral students in order to facilitate their understanding of what doctoral studies mean, what deep learning means, what are the basic strategies of inquiry-based/oriented learning and why this approach is relevant for doctoral studies. This discussion should include, as well, what are the basic research strategies and the reasons for choosing the right research methodology and digital tools, why prioritising of self-evaluation is essential and at the same time "students should not be the evaluative arbiters of good teaching practices, particularly if they have not been exposed to practices that are geared towards alternative conceptions of education … Their reactions are always moderated by their past experiences and it is necessary to deconstruct their past experiences prior to beginning to reconstruct new understandings and meanings" (from Van Oostveen's *Promotional Application*).

All of this is important because the program is focussed not only on the products of their work (declarative knowledge) but also on the process, the ways knowledge-creation takes place in general and the student's individual learning (procedural knowledge). Equally important are other individual qualities that manifest in the students' attitudes demonstrated in communication and cooperation (individual/ personal development in social settings).

3.4.4. Online and Hybrid Collaborative Studies

Doctoral students have already experienced transformed educational practices caused by Covid-19 and have their individual and collective view on modes of learning. It should be seen as a shift in attitudes to learning and modes of learning, when learners at all levels of education prefer more face-to-face classes and are willing to return to on-site connectivity. Human social nature now has a role to play. Educators and students prefer hybrid modes of studies, especially at doctoral level, therefore, doctoral students should learn how programs are conceptualised and what is the difference in learning (research is a way of learning new knowledge) between online and face-to-face studies, as well as why a hybrid mode of studies is the most preferable and how fully online community environments are created (Blayone, van Oostveen, Barber, DiGiuseppe, & Childs, 2017).

Methodological seminars and tutorial sessions at universities, also at RTA, are practised online and are interspersed with collaborative small group sessions organised by the learners using suggested platforms and self-selected tools, to jointly create a virtual learning environment. The researchers of this project observed some transitions in the learning experiences of doctoral students and also educators.

> *"Upon moving into this landscape, learners need to reorient themselves, as few are immediately comfortable, particularly when the familiar landmarks of teacher direction are missing." Besides, "the online environment does not mean the same as the physical environment. The nature of the hardware, software and the environmental conditions are completely different, with some important commonalities, from formalized physical classroom environments, offering a number of affordances or opportunities that are difficult to realize in physical formalized learning venues. The Fully Online Learning Community (FOLC) model was developed to specifically take advantage of the affordances that are available in fully online spaces, while simultaneously focusing on alternative conceptions of educational ways of knowing, doing and being" (Van Oostveen's Promotional Application).*

Hybrid studies will lead to the development of doctoral research program planning:

1) exploring ways of interacting in fully online or hybrid learning community type environments, including the characteristics of a co-created digital space, planning of shared investigation and data processing, clarifying the nature of collaborative learning, as well as what it means to be socially and cognitively present in online, onsite, and hybrid modes of studies and research;
2) investigation with respect to readiness (skills and competencies) for fully online spaces and for the world of work, so as to provide participants with tools and processes to increase their skills and competencies to match the requirements of the tasks presented" (van Oostveen's *Promotional Application*; more in van Oostveen, et al, 2016; vanOostveen & Barber, 2019).

Researchers of EILAB (Barber, & van Oostveen, 2016) use the notion 'invisible pedagogy' to examine the development, structure and pedagogical approaches used in a fully online undergraduate course that is based on principles of problem-based learning and is accessible fully online through a variety of digital learning environments, including synchronous, asynchronous, flipped classes, video podcasts, and online communities situated in social media. The authors articulate the detailed structure, challenges, success, and future directions of this online problem-based learning course.

Despite usage of digital technology in all modes of teaching-learning the environments might considerably differ and require significant pedagogical shifts on the part of educators, as 21st Century learning environments require that teachers/educators no longer act as top-down experts. Rather, they become collaborators, facilitators, and learners themselves, thus giving a perception that the pedagogy is virtually invisible, while it remains under the surface. The pedagogical principles necessary for a digital environment can be found in I. Žogla (2019).

3.4.5. A Digital Readiness Index for Learning

It has become apparent that over the past few decades, at least since the advent of digital information and communication technologies in education, there has been a convergence of thinking about the skills that are required for employability within a knowledge/information society. Transversal types of skills are required in almost all spheres of human activities and professions (Blayone, & van Oostveen, 2021; Blayone et al., 2017).

Identification of transversal and specific skills/competences, is now focused on investigating the possibility of creating quality digital readiness that enables individuals and institutions to be ready for the transformations that are required to meet

the demands of the changing work and learning landscape. Doctoral students can use information about the development of skills and competence prepared under the auspices of the OECD, European Union, UNESCO, as well as the best practices of universities around the world.

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SECTION 4. IRĒNA ŽOGLA

Discovering Smart Pedagogy of the Digital Age

4.1. CONSTRUCTING THE THEORETICAL BACKGROUND OF RESEARCH

Research will be valid, understandable, and applicable to practice, if it is appropriately subordinated to a clear theoretical basis – philosophical approach, pedagogical theoretical underpinning, and related to the research problem other theories.

The philosophical approach to teaching and learning is largely based on the theories of humans' individual development, a socio-constructivist discourse tracing back to Lev Vygotsky, The Activity Theory, which is well-suited to education by Professor of Adult Education and Director of the Centre for Research on Activity, Development and Learning (CRADLE) at University of Helsinki Yrjö Engeström (more in Section 2 of this book). Doctoral students have to select the issues that underpin the theoretical basis of their research, informed by the latest findings from Neurosciences. The widespread use of digital technologies in education suggests addressing The Computer Sciences.

High expectations of the usage of digital technologies in doctoral studies and research should be appropriately underpinned coupled with appropriate pedagogy. Doctoral students analyse the most recent sources to conceptualise and describe assumptions appropriate for their investigation, determining how digital technologies can be leveraged so that learning is facilitated and accelerated in student-driven learning.

As a viable way to consider digital change for teaching and learning in schools, the T3 alternative - *translational, transformational*, and *transcendent*, has been suggested (Magana 2017) to help teachers and learners identify pedagogy for deeper learning. This classification with due descriptions and appropriate pedagogical provision is applicable to university studies, as well as to doctoral programs.

Transformational learning, also digital transformational learning is prepared and follows the lowest level of learning-interpretation and develops further in transcendent learning (beyond common thought or experience; knowledge or practical wisdom gained from what one has encountered) or prepares an adequate background for further expert qualities.

Hattie and Yates (2013), drawing on Luria's (1976) tripartite model of learning (units: regulating mental states; receiving, analysing, and storing information; programming, regulation, and verification of activity), pointed out simultaneous thinking, successive thinking, planning, and executive function; the authors conclude that interface with a computer demands more simultaneous thinking. Investigation of

transformative digital online or hybrid learning will add to these conclusions and provide educators and doctoral students with valuable knowledge and skills.

Five essential principles for modern interactive and **participatory** teaching and learning have been defined (Bransford, Brown, & Cocking's (2000). Dr. Sonny Magana (2017) concludes that analysis of the literature allows for the following main conclusions:

- When technological tools are used to replace teachers, one can expect a very small or small effect on student academic achievement.
- When educational technologies are used to supplement teachers' instructional methods, one can expect a moderate effect on student learning.
- When teachers use technology to enhance highly reliable principles and strategies, one can expect a large to very large effect on student learning, especially if classes are combined with in-formal activities.

These conclusions are not the only valuable ones. They are mentioned here to demonstrate the importance of analysing similar investigations in order to clearly define the research problem and make use of already discovered constancies. Though multiple investigations have been completed with the respondents at school, some of the conclusions, especially those related to the use of digital technologies, could be challenging and would prompt some new ideas for investigation at universities as well.

Among the basic aims of pedagogy, its theory and practice, and research is to provide opportunities for reaching a balance between the acquisition of desired knowledge and skills, and the development of human characteristics appropriate for life in changeable societies. Maintaining a strong focus on creating the most appropriate conditions for effective learning in a highly changing and complex environment means identifying the fundamentals of learners' individual development and socialization.

> *"The strong focus on learners acquiring a diverse set of competences requires a correspondingly strong focus on pedagogy" (Paniagua & Istance, 2018, 22).*

Digital technologies have opened the world of information, cooperation, and value exchange that challenge a stronger connectivity between individuals, education institutions and the wider community or even call for worldwide cooperation. All of this forms the background to education and pedagogical paradigm shift, as well as altering the teaching-learning or pedagogical process of formal education institutions.

Among all of the things that have had an impact, the sudden pandemic introduced itself in a special way and with a particular impact on education.

"The Covid-19 pandemic was a forceful reminder that schools are not just places of academic leaning. They are part of the social fabric of our lives, and a large body of evidence sets out the important role they play in ensuring well-being and community" (OECD, 2020, 5).

The pandemic reminded in its specific way that learners' individual development is a complex process. This project provides an introduction and advice but it is not a comprehensive survey (that was not the aim of a limited project). It tries to show the complex character of an investigation in pedagogy (Education Sciences) where different sciences meet and merge to make a unique pedagogical process that is crucially dependent on the wider environment and processes outside of education institutions.

Today even the best investigation-based study programs are not able to provide learners with the knowledge and skills that might last forever. Therefore, in changing times it is wise to return back to the background statements that might help educators and doctoral students develop the most essential qualities relevant for life and work such as capability, mindfulness, wisdom turn out to be relevant and allow for purposeful, goal oriented, life-long learning.

Doctoral students should keep in mind that Man as a biological being is, however, a social being; his social being is even more important. Humans, as social beings, thrive on face-to-face connections, communication and cooperation. They

"... thrive academically, socially, physically and psychologically. Balancing these different elements has long been a challenge; doing so well in the digital world even more" (OECD, 2020, 11).

The DocTDL project was also prompted by the reality that is demonstrated by doctoral students' complicated and time-consuming attempts to find the right path and base for academic studies and doctoral research. Education and pedagogical paradigm shifts are a comparatively slow process, conceptual innovations demand time to be adopted.

The items addressed here do not insist on one right choice, they rather demonstrate the complex and contextualised character of research in pedagogy, and call for more sophisticated doctoral (and not only) research projects to explore broader issues, rather than small pieces of a unique internally integrated educational process.

Technological impacts might be positive, and yet also undesirable. Any social and technological change brings about positive and negative impacts on other spheres of human life and even on nature. Much has been written about the potential of the positive and less about the negative consequences of technological advances and their

impact of human individual development, which calls for new investigations, re-definitions, and appropriate preparation of pedagogical tools.

Alongside with lists of positive achievements in human capital building, there are warnings of the negative impacts of polarisation favouring pragmatic economical goals and computer capabilities, which bring about disproportionate and unbalanced development of individual human characteristics: their cognitive, emotional, and social skills. The rapidly changing social and digital environment cause teachers' and educators' feelings of being stuck in schools between traditional expectations and the potential power of digital technologies (Turner, 2019).

The project was initiated before Covid-19, but its implementation coincided with the pandemic and the almost totally online learning in schools and universities, including in doctoral studies. The rush to remote learning highlighted not only the immense opportunities of the digital world, but also how essential our health is, when problems focus on human existence and the attitudes towards it.

These trends are a component of educational targets at all levels of education, which is in a state of permanent change. Reports from researchers, therefore, start becoming outdated soon after they appear. If this is the case, what is more or less constant and what will be, at least to some extent, a permanent theoretical basis for pedagogy in the digital age? This question is a persistent one. The DocTDL project investigated the digital competence of doctoral students, and, certainly, the researchers could not exclude the skills and activities of educators, especially those skills that are relevant for conducting doctoral research in digitalised environments. Educators, as well as doctoral students, demonstrated some uncertainty about the multiple applications that could be used, the speed of working with on-line platforms, changed possibilities of perception, safety of the eye-sight, and the uncertainties.

> *"We can either as individuals throw up our hands and leave all these developments to either state or commercial entities to manage in their own interests, or we can try to prepare ourselves so that we can influence or even control how these developments are managed, for the greater good" (Bates, 2019, 36).*

Despite the fact that education is not the first area to implement digital advances, we still have to take into consideration that digital and other technologies are developed by educated people who are graduates of the universities where education systems are in constant transition in order to make the most effective use of technologies for the benefit of learners. Transition means constantly seeking, and moving closer to balance in the development of individuals by implementing adequate pedagogical provision, investigating its external forces, and further facilitating their developmental potential adequate for life in society.

Fundamental considerations regarding approaches and theoretical underpinnings of doctoral research include a philosophical view of humans as social beings, the role of the multiple aspects of environment in the development of individuals, and shifts in education and pedagogical paradigms.

Pedagogy being a multifaceted and complex science and practice invites researchers to underpin their research and substantiate the investigation by clear marking the philosophical position of the researcher, classical and recent pedagogical theories for analysis used to highlight the pedagogical approach and tendences, as well as other theories related to the specifics of the research problem. Join ACADEMIA (academia.edu) and this supportive organization will offer you an impressive range of publications on the topic that interests you; this will make your selection of sources less time-consuming when navigating the pool of information.

May I remind that the above mentioned and other forms of assistance do not replace the responsibility of doctoral students for the philosophical approach and pedagogical theoretical underpinning, for validity and reliability of the chosen research methodology, as well as quality of conclusions and theoretical contribution that underpin implementation.

4.1.1. The Social Essence of Humans

This is just a reminder that human beings develop their individual cognitive, emotional, physical, and social qualities on the basis of those activities, communication, and cultural settings within which they live and by which they identify themselves. The fundamentals of human nature remain unchanged, but as research and science advances, for instance, Neurosciences and Cognitive Psychology, researcher knowledge about individual human development becomes deeper. Digital technologies provide wider opportunities for deep learning, allow for deeper investigation of the development of human individual characteristics in organised pedagogical settings and/or a non-formal environment. A good doctoral investigation is one, which reaches deep understanding building on the relevant theoretical background and contributes to the further development of *The Science of Pedagogy* as part of *Educational Sciences*.

Among the most popular philosophical schools in pedagogy is the *Philosophy of Humanism*, which, in formal education settings, guides learning and teaching now widely using digital technologies, along with the invention of other modern innovations, which benefit students and educators.

The idea of humanity and its whole purpose can only be appropriately brought up, this quality does not appear on its own like physical growing. Each generation, equipped with the knowledge of the previous ones, can increasingly bring about an education that develops all natural systems of human beings proportionately and appropriately and thus leads the entire human species to its determination (Kant, 1803).

Formal education, even at the doctoral level, cannot solve all of the challenges of a changeable society, but it can enable the further self-improvement of students, develop the innate potential of man by transforming the gifts of nature in the qualities corresponding to man like capability and responsibility. In other words, following the Immanuel Kant's philosophy it means creating man within himself.

A human being develops into a person only in the society in which he lives and with whom he identifies himself. Empowering learners, facilitating development of their capabilities means providing learners appropriate assistance at particular age to develop their innate and acquired potential through multilateral activities, with the internalisation of values associated with these activities, which are then transformed into personal characteristics.

Despite the fact that man is a social being, personal qualities cannot be developed by only telling, talking, speaking and instructing. They can be developed by doing and can be tested during practice, now preferably through cooperation in partnerships. Doing leads to the fulfilment of internal aptitudes, which are able to take advantage of the growing external opportunities. An individual's already developed characteristics are those that allow for, or hinder, usage of education content, tools, or settings to further develop their individual qualities.

The ideas of humanism in pedagogy call for the free development of man, self-confidence, self-directed action, and self-expression that empowers a learner's capability, responsibility, and autonomy for lifelong self-fulfilment. Therefore, the pedagogy of humanism invites a person to develop his/her human self; it is a pedagogical theory and practice that helps learners approach a certain balance between the internal and external world, promotes the development and realisation of potential, helps a person to know and understand more, to do better, to live more fully.

Doctoral students' approaches to research are based on fundamental philosophical approaches to human individual and social development, the role of activity, communication and cooperation in social environments. Appropriate philosophical schools including theories of cognitive and social psychology, neurosciences, etc. illustrate the researcher's understanding of the identified problem and approach to the chosen research.

Drawing on L. Vigotsky, A. Maslow, C. Rodger, and many other researchers, the fundamental issue in the Pedagogy of Humanism is based on a number of insights that highlight the factors of the inner world: needs, motivation for personally important and self-directed activities, for the personal freedom to learn. This indicates the nature of pedagogical assistance, which is required when supporting not only children and adolescents, but also adults to address physical, emotional and social imbalances:

- a person is a spiritual, social being who lives and develops human potential mainly in a social environment, using available models, including those of parents, teachers, educators, and other authoritative persons;

- each person has his or her own unique way of perceiving and understanding the world based on personal abilities and opportunities that impact the way they meet the need for freedom;
- the actions chosen by the learner follow the affirmation of individuality as a personally significant value;
- in communication and action, learners express the need for personal significance and recognition, which urge the learner to accept pedagogical assistance and make this process effective;
- the idea of a person's unique development justifies an individualised and personalised pedagogical approach through cooperation;
- activity, driven by an individuals' needs, is also social - these selectively internalise the values that are acceptable and meaningful.

One of the cornerstones of humanistic pedagogy is the recognition of the versatility of development and that man is a spiritual not just a physical being (Mascolo & Fisher, 2010). Comprehensive development requires a person's harmonious, internally coordinated development. Multiple Latvian researchers had shaped the history of the development of human pedagogy and laid the foundations for today. For instance, Dr. Eduards Pētersons understood harmonious development as harmony driven by the inner world, human emotions and feelings (Pētersons, 1931).

These statements are worth reminding and accentuating in doctoral research because many undesirable phenomena in our modern society (including the economic crisis and pandemic) are not caused by a lack of knowledge, but by the abandonment and ignorance of spiritual values and responsibility. Today's scientific and technical advances are dangerous when put in the hands of smart, knowledgeable, but soulless beings, whose aim is acquisition of possessions and power at all costs. It is a sign of destructive disharmony, a dangerous phenomenon that alienates one's forces for one's full development. Therefore, transformation in education must be directed towards the learners' ability to manage digital technologies, balance priorities and disadvantages, find appropriate planning of time and energy so, that pedagogical assistance is devoted to the learners' experience of being responsible, spiritual, and mindful when using acquired powerful tools.

The holistic approach of human pedagogy to personal development presupposes the systemic nature of the external environment and the amenability of formal pedagogical processes in addressing the idiosyncrasies of development of each learner and the priorities that are important to them personally. Therefore, problems of human development, including physical, mental, and emotional balance, should be highlighted and seen as personally important.

The greatest resistance to the creation of a humane world resides in people themselves. This can be inertia and conservatism, attachment to authoritarian pedagogical thinking, materialistic rigidity of consciousness, belief that

authoritarianism is the right direction in pedagogy, laziness to accept something new, and so on. (Manifesto of Humane Pedagogy: http://www.tautasforums.lv/wpcontent/uploads/2011/09/HumanasPedagogijasManifests_LV.pdf). Five principles of the humanistic pedagogy can be found, if necessary, here: (http://facultyweb.cortland.edu/andersmd/HUMAN/PRINC.HTML)

Learning is a type of a reflective activity among other types that transforms the learner him/herself – his/her physical, mental, and emotional energy is utilised to improve his/her own abilities and take advantage of opportunities. All of the human's activities have potentially the possibility to assist with learning and acquiring new individual qualities through the generation of new knowledge, skills, and attitudes. Actually, learning is the only activity that follows the aim of changing the subject of learning/learner (the one who takes this action) or developing higher capability.

Therefore, pedagogy is a science and practice of human development in specific activities that are concentrated mainly around learning new knowledge and skills as background of multifaceted development. This concentration might be a formal distillation of selected activities identifying gaps in the learners' development. Therefore, The Activity Theory is often used to underpin research in education and to focus on learning-by-doing, by practising different types of activities.

Digital technologies are a tool in an individual's hands and mind that can impact upon human activities and human individual characteristics, but only when these are learned and applied to multiple activities and their usage is responsible or socially relevant. Teachers and educators use digital technologies usually to improve student academic achievement, but in the penetrated by developing digital technology environment there is an overarching question that shifts the priority to moral and aesthetical qualities and therefore invites educators and researchers to look for an adequate balance in pedagogy:

> *"How can technology increase empathy and understanding. ... How can technology be used to provide scenarios that enable skills development and testing in a safe environment? How can technology be used to enable students to solve real world problems?" (Bates, 2019, 42).*

Digital technologies allow for shifting the focus from the academic component of studies to attitude development: what and how should students learn and develop skills to become thoughtful, knowledgeable, capable, and responsible partners in our complicated lives? The prioritising of human characteristics introduces a shift in educational and pedagogical paradigms.

4.1.2. The Environment of Learning and Development

The multiplicity of learning environments. The environment of teaching-learning, also of doctoral research usually is a complex phenomenon created by internal environment of the pedagogical process impacted by multiple external factors and depends on peculiarities of their interaction that might be of major importance for doctoral and educator investigation, therefore, should be described accordingly.

The cognitive values of a learning environment, developed according to the principles of partnership and cooperation, create the intellectual environment, determine the quality and quantity of critical thinking, collaborative problem-solving, and the construction of meaning that occurs during the interactions of participants. The cognitive activities of partnerships include triggering critical and creative thinking, exploring problems in a team or group, integrating and synergising new knowledge, and other constructivist cognitive activities.

The concept of human-computer-human interactions introduce one more component of teaching-learning, and research environment. Doctoral research orientation for smart education and pedagogy demand re-thinking that has been triggered by newly developed Learning Theory/Science, neurosciences, concepts of digital technologies in education, and the value of cooperation/partnerships in academic studies and research. This should be clearly presented in the doctoral thesis and publications.

A particularly beneficiary environment can be created by collaborative learning and partnership that is about the construction of shared understandings for discussions, further concept development, and research experiences. Collaborative activities are most often based on four principles:

- thinking is distributed among the members of the group,
- all members of the group work on the same aspect of the problem at the same time,
- all members of the group sharing cognitive responsibility for the task at hand, and
- group members are encouraged to share their thinking as they work together.

Doctoral students will also learn the following suggested eight principles: “heterogeneous grouping, teaching collaborative skills, group autonomy, maximum peer interactions, equal opportunity to participate, individual accountability, positive interdependence and cooperation as a value” (Jacobs & Seow, 2014, 1). Researchers suggest that cooperative learning is associated with enhanced cognitive and affective outcomes; thus, intellectual and cooperative environments are connected and its effectivity in digital transformative learning should be deeper investigated to create an effective provision or a smart pedagogy.

The research orientation towards smart education and pedagogy is one of the leading directions in doctoral studies. A good deal of doctoral students' interactions and/or transactions with the educators, peers and other researchers are mediated through computers by using digital technologies. The goal of is fundamental understanding of learning theory and research methodology as the basis for designing online or hybrid learning environments augmented by digital technology.

A distinctly constructivist orientation usually creates multiple teaching-learning environments by attracting several theories to form an integrated underpinning for the pedagogical process (or design of teaching-learning). Especially in doctoral studies, this extends beyond the academic part of the program to the educators' or the scientific adviser's research, which often is centered on notions of epistemology, cognitive psychology, neurosciences, etc. and is integral to the study of human-computer-human interactions when exploring how students create meaning from their experiences.

Expansion of the environment. The environments of learning and development expand alongside the cultural contacts within which an individual lives: natural, social, technological, intellectual. This environment is currently marked by digitalisation and mobility, therefore, becomes part of the formal educational process that significantly expands the individual's internal capabilities to learn the impact of the environment and engage with the external environment to acquire new values. All of this makes the social and natural environment a complex area within which to acquire and accommodate new skills and values for comfortable living.

Under the impact of digital technologies education, in general, and organised formal pedagogical processes, transform by shifting from the pedagogy of instruction to the pedagogy of assisted self-directed, therefore, more appropriate and successful learning and research in partnership. The complexity of the environment calls for a complex approach in transforming formal education. Learning environment has stepped outside the premises of education institutions, as well as impacts of the external environment have penetrated the formal organized environment; this has changed structure of learning and research environments, introduces new aspects and problems of investigation.

Now the learning environment is made up of diverse physical locations, contexts, digitalized processes, and cultures in which students learn and are selectively involved in the interaction with environmental components and processes. Since students can selectively learn in a wide variety of settings, both inside and outside of institutions, the learning environment encompasses the culture of the institution and the wider community. Actually, the learning environment is framed by the learners' activities that are driven by individually meaningful values and attitudes – only that part of the environment with which a learner comes into contact, becomes a learning environment.

The Covid-19 pandemic has changed the education landscape and the attribute 'crises' appeared in the university context.

"Crises require innovative, creative and cutting-edge approaches to unknown situations, and this is rarely able to be accomplished by continuing to do what has always been done or what has always worked in the past. Nor can crises be addressed when bureaucracy and red tape ensure that new and untested approaches do not fit within existing rules, regulations and procedures. This is where genuine flexibility and genuine agility are essential" Ling, 2020, 2).

Wider learning environment and new access problems. Current reform of education calls for appropriate changes to the system (not so much 'patching' up the system) of education by starting with its core that is the pedagogical process, with the focus on learner individual development through communication (preferably discussions that trigger new activities, thinking, rethinking, and generate new ideas) and varied activities, that integrate the curriculum/program with wider contexts in the micro, mezzo, and mega communities.

The latter decides for "the value of learning institutions in a society that accepts ubiquitous and hands-on nature of learning and is capable of better measuring a wide range of its outcomes" (OECD, 2020, 23).

Among the first set of problems there are education institutions' programs that are being developed in comparatively slow pace and become updated before their implementation starts; e-studies and distance learning do not resolve the financing problems, technical supply problems remain unresolved yet, etc.

Although the education system is changing in the context of a global environment with competitive knowledge economy there are still problems with unequal access to education for multiple reasons (location, assess, equipment, quality of internet connection, etc), and this remains the responsibility not only of students, but mainly of public authorities. Education policy must focus on balancing opportunities (usually this is investigated within the area of Management Science).

Pedagogical process as part of learning environment. In this context the research-based models of the pedagogical process are a matter for education in general, and doctoral research in particular, that results in the development of new appropriate pedagogical/didactic scenarios based on *The New Learning Theory* and *Partnership Pedagogy*, that includes achievements of the *Neurosciences* and *Computer Science*, which have emerged in the past decades. The developed models/scenarios should take into consideration that not all learning and skill development takes place in formalised learning institutions. Therefore, these should distinguish between the choice of instructional teaching methods that were essential for the industrial age and ways to facilitate the development of learners' self-directed, autonomous learning by creating

the relevant environment of partnerships for "the intergenerational transmission of advantages" (OECD, 2020, 24).

The growth of non-formal learning coupled with digital technologies transforms the pedagogical process from information provided by educators, the introduction of new items, and control over the learners' knowledge acquisition to quite another sequence of the process that focuses on the learners' knowledge-creation, deep understanding, and identification of problems to be solved in practice.

Teachers and educators, therefore, transform their knowledge and skills, as well as re-conceptualise pedagogy, which they then apply to better integrate formal process with informal learning, as well as make meaningful use of dominating digital technology. These areas should make a learner's unique learning environment that is changeable, polarised, often imbalanced, but always focused on the learner benefit, therefore, educator assistance in partnership is welcome.

> *"Studies of teacher knowledge hypothesise that differences in the conceptual quality of teachers' knowledge can better differentiate quality teaching because (competent) performance is based on an underlying pedagogical knowledge base" (Guerriero, 2017, 3).*

Educator pedagogical beliefs in widening learning environment. Despite the tendency to greater autonomy of learners, also doctoral students, the educator role is still remarkable in creating learning and research environments. The educator choice of teaching approaches and even use of technologies is absolutely dependent on beliefs and assumptions about the nature of knowledge, about the requirements of the subject, and about how educators think students learn. The way educators teach in higher education will be driven primarily by the beliefs, or rather by the commonly agreed consensus within an academic discipline, about what constitutes valid knowledge in that subject area (Bates, 2019, 67-68). The professional belief becomes central in designing pedagogical process and creating appropriate learning environment be it framed within the walls of the educational institution or well represented by a much wider environment.

Pedagogical process is a specific, created, and maintained learning and learners' environment that is designed for the optimal development of those participants involved. It removes obstacles, distils the most effective learning tools (like digital platforms, didactic models, and equipment), provides professional assistance to keep the pace and achieve as much as is possible within the allocated time; in the recent history this aspect had been called 'optimization' (Бабанский, 1977).

Transformation of the process, which actually is a complicated system, is not an easy job causing traditional education lag behind technological progress. The only effective transformation could be when learners, at least at the highest levels of

education, are involved and participate in the processes where technologies are being developed, but this is the sphere of highly qualified specialists that is protected for the producer's interest.

In traditional settings simulation and gamification, laboratory activities and projects, experiential learning and learning-by-doing can help. These forms and strategies still work but the researchers' concern should be focussed on their possible formal component since many of these are not authentic activities.

The more self-directed learner activities are especially outside the institutional frames the more likely these activities are moving away from the formal programs and standards; educators need a special sense of learner benefit when they choose their own way towards the formal goal and add to it their individual achievements.

The complexity phenomenon. Pedagogical problems (wider connectivity of formal and non-formal modes of education, partnerships of individually diverse learners and educators, an environment exploded by digital technology, the growing impact of knowledge on human activities, etc.) are complex. Understanding of this complexity will help current and future educators, students, as well as education leaders make sense of advanced technology and digitalization, globalisation, cultural change, and much more, and how these are to be represented in the curricula/programs.

Therefore, *The Science of Complexity or Complexity Theory* can help all of us meet the challenges and use the most effective opportunities when we are faced with the digitalised environment that marks a new epoch of human history by challenging a complex approach to the complexity of learning environments. J. R. Turner & R. M. Baker (2019) analysed the usefulness of *Systems and Complexity Theories* related to education and identified disconnection as better for addressing complexity and making sense of developing technologies in open social systems. Educators, doctoral students, and teachers will continue facing the need to apply *The Complexity Theory* as wicked problems become more prevalent in the social environment, pedagogy, and educational sciences in general. Pedagogy itself is a complex phenomenon.

Avoiding reductionist approach. Researchers (Gregory, Atkins, Burdon, & Elliott, 2013; Turner & Baker, 2019) have noted that many of the existing project implementation, management tools, and methodologies, including those related to education, are still reductionist. Researchers in education should preferably draw on studies from complex, dynamic systems to gain new insights into developing new techniques and methodologies, thus conducting a shift from reductionistic research (e.g., single-species research), compartmentalised decision making, and policy formulation to one that recognises complex systems with multiple elements like ecological, social, economic, and political. Reductionist approach should leave space to complex phenomena and concepts and categories that bring about complex but common understanding.

The Complexity Theory, at its fundamental level, has an understanding of a hidden order to complex systems like pedagogical processes, human behaviour, relationship, etc., which are now developing as more and more open systems, that are complicated to investigate. Nevertheless, *The Complexity Theory* investigates the structural units of the object that is under research by not only more detailed understanding the parts, but crucially, seeking to understand how each part interacts with the other ones in the system of the entity. It also seeks to define how this interaction emerges to form a new entity, thus discovering a more complete understanding of the research object such as the complex character of a learning environment.

> *"Such assumptions include the premise that closed models are adequate for modelling processes occurring in open systems, that models can be universally applied and do not need to specify where and when they should be used, that a system is equal to the sum of its parts, that time is reversible, that causality is linear, that future outcomes–like the future itself–can be predicted, and that environments are relatively static and tend toward equilibrium" (Jayanti, 2011, 103).*

The Complexity Theory is showing new promise for disciplines studying complex systems as it has the potential ability to provide insight into the dynamics of organisational change, therefore, appropriate for research in the complex field of today's education. The Complexity Theory is a promising tool for disciplines studying complex systems like pedagogy. In contrast, reductionist methods reduce complex phenomena into elementary parts and work well as long as the observed object is isolated from causality – an approach that is only seldom relevant in pedagogical research, and if used, should be put into a wider context of the active environment.

The more complex phenomena are being investigated, the wider thematically research is, the more relevant researcher partnership becomes. Again, the wider is the pool of sources involved in academic studies the more relevant is learner and educator partnership in pedagogical process.

Blended learning and partnership to operate in wide environments. Deep knowledge and understanding of oneself, others, society, work and nature, as well as developed transversal and specific skills expand the capabilities, activities, power, benefit and impact on the environment, and self-regulated responsibilities of people. Educational and pedagogical strategies, therefore, are shifting from dominating on-site classes to blended learning, making extensive use of digital technologies and prioritising self-assessment and peer assessment to maintain a balance between individual and social development, between increasing the quality of knowledge, skills and attitudes and the moral responsibility of learners to preserve and protect living and non-living nature when creating a more comfortable environment for human life.

An individual's education takes place and is successful or empowers the learner if the process is based on the psychological constancies of cognitive, emotional, social and physical development. The educative component in the system of education needs to be focussed and the academic achievements evaluated only through the lens of human capability to maintain, strengthen moral values, and responsibility.

Scholars constantly seek deeper understanding of individual human development and the environment in order to provide learners with appropriate possibilities. The more educators know about human development the wider learning, teaching, and research environment opens.

Since *The Computer Science* and digital technologies have considerably expanded the learning environment, there has been a desire to better define the transformative nature of digital technologies and to increase the rigour of didactic or pedagogical settings in a changing environment based on the synthesised New Learning Science/Theory that itself is in constant transformation. The OECD/CERI International Conference "Learning in the 21st Century: Research, Innovation and Policy" has published a distillation of the analyses and events over the previous seven years of the OECD/CERI project "Learning Sciences and Brain Research". The report suggests new insights on learning through updated understanding of cognitive and brain science focussed on brain functioning known as the birth of a *The New Learning Science* (OECD/CERI, 2007).

The report advises that findings from brain research indicate why nurturing is crucial in the learning process, and how these findings are providing indications of appropriate social and digital learning environments. The report also accentuates the importance of the integration of a neuroscientific perspective with education for a deeper understanding of human mental activities and to ensure a balanced and responsible building of knowledge and capability. As well the report reminds us that the recent

> *"advances in neuroscience have produced powerful insights while educational research has accumulated a substantial knowledge base. A neuroscientific perspective adds a new, important dimension to the study of learning in education, and educational knowledge could help direct neuroscience research towards more relevant areas" (OECD/CERI, 2007, 12).*

What is new in the New Learning Science? Researchers (Varma, McCandliss, & Schwartz, 2008) have published their analytical vision of possibilities to bridge *Neuroscience* and education. Soon after the conference Springer (2010) published the book titled "New Science of Learning. Cognition, Computers and Collaboration in Education" (Eds Khinelssa, & Saleh) that has been followed by multiple publications

under the titles of New Learning Theory and New Science of Learning (Sawyer, 2006; Khine & Saleh, 2011; Khinelssa & Saleh, 2010; Hoadly & VanHneghan, 2011; Darling-Hammond, et al, 2019). Connectivism has been called the 21st century's new learning theory (Kropf, 2013) with the undeniable contribution of digital technology and an open information space for communication and cooperation in partnership – the more open and wider is the intellectual environment the more partnership in learning and research is welcome. These emphases call for new ideas and a deeper investigation in doctoral research.

The term ‘new’ in *The New Learning Theory, The New Science of Learning, New Pedagogy* actually says nothing in terms of scientific research, except that it is time to change something important in education. It is evident that during the last two decades that, what had been new then, has become not quite as new now. Besides, constant updating is and has always been among the basic peculiarities of pedagogy, that it must be new by its nature. As its theoretical concepts change after each paradigm shift, it has been 'new' many times in its history. Therefore, the term ‘New Pedagogy’ also loses the alarm it foreshadowed in the 2000s and should be changed to a concept that represents the central idea of the paradigm that has emerged and is appropriate for the current social environment. Before identifying the most appropriate concept for ‘new pedagogy’, the approaches before and after the paradigm shift should be compared. In other words, instructional (normative) pedagogy and the ‘new’ one, should be described in detail using appropriate terminology, to create the theoretical basis for a pedagogy that is relevant for connectivity, partnership, and Digital Transformative Learning informed by Neurosciences.

An integrated vision across different branches of science in favour of the development of Education Science/Pedagogy became the highway for research looking for appropriate ‘educational design’ (this term is similar to that of ‘pedagogical process’) able to meet the current and future needs of a digitalised knowledge society by adequately preparing schools and university graduates. Doctoral students may now have come closer to identifying what concept would best express the ‘new pedagogy’ of the 21st century, so that it reflects the essence of pedagogy, its theory and practice in the open learning environment. We will return to this later, because it is today’s researchers, who develop the terminology of their science and contribute to its development.

What does history teach? A short retrospective might help doctoral students to establish a theoretical basis for their research in pedagogy and rule out pointless misinterpretations of theories. The basic assumptions of The New Learning Science (a reminder: an important component of a science is its theory, which is created on the basis of researched practice) appeared in the1970s when cognitive psychology, computer science, sociology, and other disciplines merged, this symbiosis manifested itself in deeper thinking and philosophy of learning. In the 1990s, after 20 years of

research, scientists agreed upon the basic features and components of the new theory (Bransford, Brown, & Cocking, 2000) that made New Learning Theory much clearer:

- a deeper conceptual understanding and the building of new knowledge on the prior knowledge of learners;
- deep learning (new knowledge related to prior knowledge, integrated into a conceptual system, understanding of principles, evaluating new ideas, argumentation of logic, reflection on their own ideas, understanding the process of learning, and creating contextualised knowledge);
- creating wider learning environments and focussing on learning in addition to teaching;
- the importance of reflection and self-evaluation;
- social settings for creative learning in cooperation and communication.

Learning is a specific and very important activity for a human's individual and social development, but it is not the only one. Selection of background theories depends on the researcher's vision, the problem, the object being investigated, the idea of improvement etc., contextualisation, when, for instance, concepts from communication science or computer science, etc are included. This contextualisation can add to the theoretical underpinning of the research.

Today, and in the nearest future, education is about the capacity to process information and solve problems, which includes robust disciplinary knowledge as well as the development of analytical, creative, and critical thinking skills. It is about broader abilities that, while related to cognition, have also to do with interpersonal and intrapersonal functioning, such as social and emotional skills, tolerance and respect for others as well as the capacity to self-regulate and better understand one's own learning process (Guerriero, 2017; OECD, 2020). These values have been investigated in the past but with the emphasis on the previous social and economic perspectives. Now these need appropriate definitions, content and context descriptions to address many of the existing shortfalls (they appear both objectively and subjectively). The role of formal education is growing by maintaining a balance between institutional and informal education, access to and quality of education, self-directed and facilitated learning, etc.

Self-assessment and peer-assessment should be prioritised and contextualised with the educator's assessment using discussions, arguments, and viewpoints to lead to new knowledge, coupled with tolerance and other social characteristics. Education is a social phenomenon and it takes place in a social environment that allows for situations to be transformed into open spaces for new information, discussions, and exchange of views and visions.

The individual development of learners and empowerment of their capabilities are among the main targets of formal education, but in an open and mobile society with free access and exchange of information and cultural value, learner responsibility,

tolerance, empathy, and other moral and aesthetic characteristics have priority as this form the lens through which high quality skills, sophisticated knowledge, the individual's capability, and other qualities are tested and evaluated. Evaluation by educators and teachers is important. It acquires educational value and promotes the learner's responsible action, if the learner understands its value for their individual development, in other words, evaluation is meaningful.

4.1.3. Shifting Pedagogical Paradigms

From learner-centredness to learner learning centredness. Following the accepted education paradigm, which is usually defined in education law, pedagogical paradigms provide a theoretical or conceptual basis that suggests multiple didactic models appropriate for implementing a paradigm or approach in formal education. The Activity and Complexity Theories at the basis of educational and pedagogical paradigms, therefore, introduce pedagogical paradigms that implement the transition from learner-centredness to that of learner's learning centredness, by in-depth study of learner development in organised settings that integrate impacts of the wider environment. The approach follows the idea that in education it is not possible to change a person directly, only the person himself changes his qualities in actions and communication; teachers, parents, educators, or other participants can change learners' environment and actions/activities that is the basis of a person's individual development.

Research-based models use opportunities to improve learners' multilateral activities and communication as a basis for the development of their individual characteristics appropriate for life in digital communities. A deep understanding of the role of multilateral activities in human individual and social development forms the background for the implementation of appropriate modes and models of learning and assisting, participation, and connectivity that are appropriate for living in an open, digitalised world.

The majority of doctoral students, before they take up doctoral studies in education, already have some teaching and self-directed learning experiences or have combined studies with work. This is therefore a promising basis for the creation, initiation or launch of research-based doctoral studies integrated into research, enhanced in collaboration with teachers and students.

Usually, a number of theories are updated and practices are described accordingly, such as constructivism, experiential learning, project or case-based, inquiry-based, sociocultural and other theories and didactic models are actualised in the context of a paradigm shift. These have made an impressive contribution to education and the principal frameworks for research about online learning. These theories provide the potential for accentuating the learner's ability to construct or generate their own

understanding, with the assistance of educators or colleagues in their role of ‘experts’. Cooperation and partnerships mark an appropriate pedagogical paradigm to unleash and exploit synergies.

From individual activities to partnership. Addressing well-known theories highlights the shift from the traditional ‘active’, ‘individualistic’ learner engagement to participatory and holistic approaches to learning through research (discovering is not enough as it can be done by transmitting of ‘ready-made’ knowledge to learners). Digital technologies are used to enhance the process, balance self-regulated learning with the official arrangements (Vlachopoulos & Hatzigianni, 2017) and enable deep learning. Meanwhile, each theory has a potentially valuable as well as limited or even negative impact on learners' achievements (for more ideas see Bates, 2019, 72-88). I would suggest doctoral students expand and describe in detail the concepts of ‘participation’ and ‘partnership’ which are more fully in line with the university and doctoral levels of study, leaving the concept of ‘involvement’ to more rudimentary levels of schooling, as well as for special cases.

The choice of a digital learning approach for educators and doctoral students is not a random affair. The types or levels of self-regulation in research and academic studies may depend not only on the knowledge and digital skills acquired, but also on the choice or selection of learning theories and approaches, their arrangement in the system, the mode of learning, teaching-learning models that are often centred on, and even led by, well-established collaboration and partnerships between educators and doctoral students.

Learner and educator endeavours aimed at synchronous activities are often accompanied by an asynchronous rhythm. These and other inconsistencies can be multiple, and their interference in coordinated action in and between online teams can also vary and lead to low levels of partnership development and achievement levels. Consequently, learner and educator academic success is accompanied by emotional reactions affecting trust and wellbeing. This appears to be an important reason for, and the value of, expert educator assistance in adult (also doctoral) formal or further learning.

Dr Anthony Bates, research associate with Ontario’s Distance Education & Training Network, despite focusing on school education, suggests that to avoid inconsistencies, educators need to be empowered to handle serious change, by having a theoretical and knowledge base, that will provide them with a solid foundation for their teaching, no matter what changes or pressures they face. Educators should understand and follow the underlying principles that guide effective teaching in an age when everyone, and in particular the students whom educators are teaching, are using digital technology. The researcher opens his personal site with a reminder:

"Good teaching may overcome a poor choice of technology but technology will never save bad teaching" (Bates, 2019, https://www.tonybates.ca/).

Collaboration between educators and researchers stems from the choice of the educational/pedagogical philosophy and its possible impact on their understanding of the concepts of *Education Sciences* and the *Science of Pedagogy* and practice (this divided discussion is still on-going). I suggest following the conventional approach, that pedagogy is the theory and practice of the acquisition of formal or institutionalised education and adequate learner development. Moreover, the terms education and pedagogy are treated as synonyms with well-developed theories of pedagogy. It is pedagogy that maintains and cultivates partnership relations in formal settings. From this point the theoretical basis starts, followed by adequate models and methods of teaching-learning, while both approaches can be interchangeable to an extent and improve each other.

The above-mentioned and other researcher findings encourage doctoral students and their scientific advisors to look at the theoretical considerations and pedagogical practices that are appropriate for doctoral students and adult education, especially for the development of the doctoral study process and the further pedagogical self-empowerment of educators. The implementation of the pedagogical paradigm of partnership rests on the abandonment of the traditionally strong boundaries of the roles of teachers and students and strengthening their interchangeability in the environment with an unlimited access to information.

Is pedagogy obsolete or may become obsolete? This question appears because of the discussion that pedagogy has lost its relevance, so it is necessary to move to educational sciences that would be relevant in a wide learning environment with many technological possibilities.

Let us take a step aside to recall that teachers and educators form two large groups of those who adhere to the Science of Pedagogy as the theory and practice of formal education, and those who consider pedagogy to be an old-fashioned synonym for teaching and recognise Education Sciences generally adhere to educational psychology principles; these Sciences include as separate sciences pedagogy (teaching), content and curriculum theory and practice, learning, and even education policy, organization and leadership etc. Meanwhile, the Theory of Pedagogy uses psychological constancies to integrate curriculum theory and practice, content, organisation, etc. to form a unique basis and appropriate learning environment for learner, teacher, and educator activities. The Theory of Pedagogy does not exclude deeper investigation of content, curricula, etc. to constantly update the integrity of the pedagogical processes.

There is a saying: teachers teach what they preach. In Latvian traditions the Science of Pedagogy synthesises learning and teaching into a unique complex theory

and practice emphasising the integrity of the process. Pedagogy, according to this concept, creates a specific Complexity Theory and general background of the discipline didactic. The theory of pedagogy can, therefore, be considered as a professional philosophy of teachers and educators, which functions as 'philosophy-in-use' (Hessens, 1929) and when coupled with appropriate modes, methods, and organisational settings of the implemented pedagogical views in line with the social environment, in particular technological and other developments; these guide teacher and educator choice of practical activities. It is quite clear, that educator in-depth knowledge of content and skills in a particular discipline alone can introduce a 'pedagogical patchwork' and is not enough to create and conduct an effective pedagogical process that should be based on the general pedagogical principles or its theory as a whole.

The Journal of Learning Sciences which appeared in 1991, and the debate whether education/ pedagogy is a science or art, whether pedagogy is a synonym for teaching were discussed on its pages. This discussion appears also in other issues. Irrespective of their approach and position in pedagogy and education, researchers seek to improve the organised environment of formal education, which is extended by non-formal learning, and seek to provide the best possible support for the development of learners. The ideas sometimes reach the pinnacle of extremism and demand the closure of institutions of formal education to develop online learning instead. In any case, doctoral students must establish an appropriate and clear theoretical basis for the research and clearly define the concepts for at least two purposes:

a) to form a unified and logical research structure and the essence of doctoral theses;
b) to make the doctoral dissertation or articles easy for readers to understand.

Following on from a philosophical or theoretical approach, researchers develop the terminology and concepts of their field of science and practices. There are lots of scholars and researchers who continue to develop pedagogy, recognising the fact that clever pedagogical assistance to learners becomes even more valuable as technological development becomes more and more complicated. The reality needs to be respected, that when it comes to learning, teaching exists as a social phenomenon, and it becomes meaningless if nobody is following teaching. Some educational researchers have used terms that are synonyms for teaching, for instance, the 'scholarship of teaching' to describe the existence of teaching theories that teachers and educators have developed and the ways in which these can be applied (Kreber & Cranton, 2000; Trigwell, 2001). Professor of Learning with Digital Technologies (UK) Diana Laurillard uses the term "Design Science" to describe teaching that empowers learning. The term 'design' is close to the term 'pedagogical process', the latter is common to the science of pedagogy in Latvia and is based on the concept that pedagogy, as a reality, appears when teaching

(assisting, facilitating), learning (self-directed and empowered by facilitation), and the subject-matter (a pedagogical tool) form a single and unique whole.

> *"The imperative for teaching is that learners develop their personal knowledge and capabilities. ... Teaching is more like a design science because it uses what is known about teaching to attain the goal of student learning, and uses the implementation of its designs to keep improving them" (Laurillard, 2012, p.1).*

In early 1990s, Professor Seymour Papert (Papert, 1993), who is considered the world's foremost expert on how technology can provide new ways of learning, teaching, and thinking in general, talked about children using computers as instruments for learning and for enhancing creativity, innovation, and 'concretising' computational thinking. His concept of teaching and instruction could prepare graduates for the industrialised economy of the early 20th century.

Now the traditional focus has been shifted and has changed for an entirely new pedagogical phenomenon to introduce appropriate learning assistance for graduates in a technologically complex and economically competitive world, knowledge society and economy (Bereiter, 2002). The author presents what he calls 'a new theory of mind', and introduces a way of thinking about knowledge and the mind. Memorisation is not enough in today's Knowledge Age, the traditional conceptual tools of education become inadequate, therefore it is the basic understanding of the human mind that will carry education into the Knowledge Age and it should develop the following essential qualities:

- the human mind is not a container to fill with knowledge;
- the growing role of individual minds in societal knowledge production – understanding how the brain, thus constituted, could sustain knowledgeable and intelligent behaviour;
- models of education should be developed on the basis of the updated theory of mind drawing on current ways of thinking about knowledge and the mind, including information processing, cognitive psychology, situated cognition, social constructivism, and connectionism.

In the knowledge economy and knowledge society educated graduates need not only well-developed skills and competences. They need a deep conceptual understanding of complex phenomena and the ability to critically evaluate the world themselves, what they read or learn. They are expected to work creatively and generate new knowledge, concepts, ideas, theories, other products, and contextualise their knowledge. Thus, the achievements of the learners challenge the deep knowledge of teachers and doctoral students' scientific advisors, their understanding of the processes in the changing world and ways of facilitating doctoral learning by practising pedagogy

appropriate for doctoral studies. This knowledge should be combined with the ability of teachers and students to identify gaps in the understanding of doctoral students and their descriptions in theses (dissertations) and publications, as well as the ways of closing these gaps.

The more complicated is the learning content and looser are the borders between formal and informal learning making the learning environment complicated to navigate the more elaborated should be educator assistance or pedagogy of adult education.

Shifts in learner and educator roles. Meanwhile, educators and scientific advisors might be allowed to not know all technological novelties or the details of the impact of a complex environment on education and design of the education process. The growing complexity challenges students' participation in the design of the pedagogical process that is most appropriate for students. This can be investigated, discovered, and described in-depth by doctoral students under the astute guidance of their scientific advisors. The current speedy and widespread development requires teams of educators and doctoral researchers, research-driven learning, and exploration of newly emerging issues in partnership, characterised by the interchangeability of their roles when educators assist students and students assist educators.

If we speak of 'new pedagogy' as a set of theories and practice of institutionalised or formal education, I would say: this is the time of Partnership Pedagogy. The New Learning Theory/Science nowadays embraces discoveries of Neuroscience for a deeper understanding of how humans learn using digital technologies. Partnership Pedagogy seeks to reinforce the emphasis on collaboration in the onsite, online, and hybrid environments. It can, therefore, be characterised as an integrated theoretical basis for a more effective kind of cooperation that is operating in an organised and wider environment and that focuses on the learners' conceptual understanding of the functioning of the mind and creative usage of knowledge and skills in transformative digital environments.

Unchangeable remains the pedagogical principle of assisted learning or learning through research; the principle changes concrete practices introduced by the role interchangeability and therefore strengthening of partnership relations.

Despite the fact that doctoral studies are characterised by a high degree of autonomy and the students' relatively free use of digital technologies, some uncertainties remain or appear in a changing society which require further investigation, and are suitable for doctoral research. In addition, doctoral studies are classified as the highest stage of formal institutional education that follows standards and accredited programs, therefore, not only allows but also provides pedagogical assistance to optimize studies and research. These include educator-conducted academic studies and research – the area of the functioning of pedagogical constancies that can be better implemented in educator-student partnership:

- understanding of its principles, which now incorporates digital technologies as a tool for learning and which is used appropriately at all stages of the pedagogical process;
- self-evaluation and evaluation of the prior knowledge and skills of students and educators;
- clearly defined, meaningful objectives for learning and assisting/facilitating;
- modes and methods of supporting autonomous inquiry-based learning;
- student and educator self-assessment and peer-assessment;
- vision of future long-term and short-term goals that if transformed into new aims open a new cycle of the process.

"Knowledge dynamics may be viewed as a complex system, in which multiple actors interact to shape teachers' knowledge". This includes the importance of empowering teacher educators and teachers themselves to take charge of the teacher's knowledge base (Guerriero, 2017, 15). Emerging evidence has the potential to broaden the pedagogical knowledge of educators about student learning, however, more is needed to be able to improve pedagogy, teacher education and the professional development of teachers/educators (Bereiter, 2002, 17).

To be of an appropriate quality for doctoral studies in the digital age, pedagogy needs to have at its core a dialogue between oneself and peers, educators, and representatives of the wider communities. This will help pedagogy to be transformed from dominating instruction to a pedagogy dominated by balanced partnership activities and research inquiry, the exchange of views in discussions, that produce synergy allowing for critical analysis and deeper self-evaluation for further achievements.

Certainly, in an era of crucial social changes and digitalisation of processes, the term 'pedagogy' is not without its critics, like the other sciences and practices. There is no chance of avoiding critics, particularly of the growing importance of non-formal learning in the field of post-compulsory education and digitalisation. This phenomenon triggers research and, consequently, further development of pedagogy, resulting in a new attribute – The Partnership Pedagogy. The desired focus on learner autonomy in digitalised learning makes it tempting to consign the idea of pedagogy to history. This, actually, is not that easy to commit to, as it is impossible to deny a significant human phenomenon when more experienced, knowledgeable and capable people assist others learn to live in the current and future society.

Addressing the core of a paradigm shift. Philosopher Thomas Semjuel Kuhn (1996, 4th edit. 2012) introduced the term 'paradigm' to define an important change that happens when the usual way of thinking about or doing something is replaced by a new and different way. According to T. Kuhn the development of a science is not a uniform affair; sciences develop through a comparatively slow or 'normal' phases and 'revolutionary' or 'extraordinary' changes. It is important to identify the paradigm to

be practiced and to have a deep understanding of its essence because the relevant theories determine practical operations in teaching-learning, as well as measurements are paradigm-determined.

> *"According to such opinions, science develops by the addition of new truths to the stock of old truths, or the increasing approximation of theories to the truth, and in the odd case, the correction of past errors. Such progress might accelerate in the hands of a particularly great scientist, but progress itself is guaranteed by the scientific method." Stanford Encyclopaedia of Philosophy, ch.2).*

There are other authors who define the term 'paradigm shift', for instance Dr. Will Kenton:

> *"The term paradigm shift refers to a major change in the worldview, concepts, and practices of how something works or is accomplished." (Kenton, 2021).*

Broadly defined, a paradigm is a set of beliefs, practices, a mode of inquiry based on the related theories, principles, models, taxonomies, methods, rules and assumptions that define and provide the framework for a given knowledge domain (science of pedagogy, science of management, computer science, etc), study discipline, and field (like education).

From the perspective of education, at the domain level, there is (a) the scientific paradigm, (b) the humanistic paradigm and (c) the artistic paradigm (Blessinger, et al, 2018).

Pedagogical paradigms can be distinguished by the domain of the components of pedagogical process: (a) content or subject-matter, (b) teacher and teaching, (c) learner-centred, and (d) learner learning-centred paradigms.

Doctoral students will identify between (a) education (a field that is strongly impacted by the political system) and (b) pedagogical paradigms (theory and practice of formal processes). Those who choose tracing the historical investigation should analyse at least three movements in education to identify slow and revolutionary pace of changes in the theories or knowledge domain of education/pedagogy to use appropriately the term 'paradigm shift':

- *Progressive education* is a pedagogical movement that began in the late nineteenth century and is being followed to the present. The term 'progressive' is used to distinguish this tendency in education from the traditional curricula of the 19th century and classical pedagogy that by then strongly differentiated educational provision by social class. A good

question has been asked by William Hayes (2006) if *Progressive education* is still practiced in today's schools.

- *Reformpedagogy (Reformpaedagogik)* as a notion that stands for a movement in education appeared as early as the 19th century, albeit still very inconsistently. Reformpedagogy in the narrower sense means those attempts at the end of the 19th century and in the first third of the 20th century against the alienation of life and the submissive authoritarianism of the prevailing "drilling school".
- *New Pedagogy* stands for the understanding of pedagogy that is based on the latest achievements mainly of Cognitive Sciences, the New Learning Science, and Neuroscience that recognize learner individualit y in learning and is empowered by the findings of Computer Science. The paradigm shift (if it is paradigm shift) is marked by connectivity and especially by partnership relations in formal education, therefore, the core is related to learner activity (the Activity Theory at the background) and is learner learning centred. The core understanding emphasises learning that is determined by the learner individual qualities. Development of the *New Pedagogy* is still in progress; therefore, its title is indeterminate and fuzzy. Following the creation of the essential features, there is reason to believe that *The Partnership Pedagogy* is being formed.

Principles guide implementation of paradigms. Principles represent general pedagogical constants or laws that has numerous special applications across a wide field of formal and non-formal processes; principle is a proposition that serves as the foundation belief and approach that provide main operating conditions.

Some of considerations and pedagogical principles are set out in connection with DocTDL project publications (see the list of project publications) respecting the pedagogical traditions of Latvia. These introduce its updated content, the constant renewal of pedagogical tools, and the redefinition of categories and concepts rather than exclusion or fragmentation, when a systemic vision of complex educational processes is most needed. Doctoral students and other researchers have to address inconsistencies when investigating a paradigm shift, re-defining and describing the changing components and phases of pedagogical processes, so that the content of principles is updated and pedagogy is appropriate for education in transition.

Digital technologies introduce a paradigm shift with specific and multiple impacts on the nature of knowledge in society, constituting a new context. This, therefore, impacts the nature of learning by more targetted usage of dialogues and discussions in teaching-learning, including the findings and conclusions of Neuroscience and other learning-related sciences, to leave more space for the students' autonomous learning and development. The researchers (Beethem & Sharp, 2020) have provided more

arguments in favour of pedagogy:

- *considering the continuities across different contexts of learning, the ways that people learn, and how they can best be guided to learn, are no longer concerns that belong behind school gates;*
- *at a time when learning is increasingly seen as a lifelong project, it makes sense that the associated 'art or science' of guidance should extend its scope into adulthood;*
- *'pedagogy' embraces an essential dialogue between teaching and learning,* theory and practice that is particularly significant in a context of educational discourse in which the two terms come to be used in tension and even in opposition to one another. The term 'pedagogy' is used

> *"... in the original sense of guidance-to-learn: learning in the context of teaching, and teaching that has learning as its goal. We believe that guiding others to learn is a unique, skilful, creative and demanding human activity that deserves scholarship in its own right. We will not be afraid to use the term 'teaching' as well as 'learning' ... recognizing that education concerns not only how people learn 'naturally' from their environment but also the social interactions that support learning, and the institutions and practices that have grown up around them. In fact, the essential dialogue between the two activities known teaching and learning in formal education is at the heart of what we mean by 'pedagogy'..." (Beethem & Sharp, 2020, p. 2).*

Despite the existence of at least two quite opposite views of pedagogy, educational researchers of the last century have done much to reinvent and further develop pedagogy as the art and science of teaching which brings with it a learning presence. This needs to be re-visited now in the context of new theories of learning, neurosciences, and digital transformations to serve children, adolescent, adult learning and individual development in partnership-based communities.

> *"It is true that none of these technologies has changed human beings' fundamental capacities to learn, if learning is understood in purely cognitivist terms. But they have profoundly changed how ideas and practices are communicated, and what it means to be a knowledgeable or capable person" (Beethem & Sharp, 2019, p. 4).*

To complete a successful educational investigation, researchers should redefine the pedagogical categories, concepts, and didactic principles of facilitating learning with digital technologies, and the internal constant links between the components of

pedagogical processes. For instance, literacy is not limited by fluent reading, writing, and speaking relevant for a particular level of education (from primary to doctoral); accent is shifted to the learner individual achievements.

Introducing new concepts instead of the well-functioning ones is not the most productive entertainment, though, there may be components or phenomena that did not exist before, and some traditional phenomena may have changed their etymological component. For instance, despite the critiques and even denial of pedagogy for its etymological connection with children,

> *"... contemporary use of the term has lost its exclusive reference to childhood while retaining the original sense of leading or guiding to learn. We observe that the need for guidance is not confined to childhood, and that even the most self-directed of adult learners can benefit from the support of others" (Beethem & Sharp, 2019, 1).*

The continuous extension of formal education from the early-years to tertiary and doctoral education has caused evolving notions of human learning and changes to learning goals for individuals. Improvements in previous stages of education are reflected in the programs (curricula) and have facilitated the improved development of doctoral students' digital skills and started to improve the competencies of their educators. In addition, education is considered critical for the knowledge economy and builds human capital by increasing individuals' capabilities, enhancing economic productivity and facilitating the development and adoption of frontier technologies (OECD, 2020, 23).

Educational goals are being shifted from 'pure' knowledge to the ways in which understanding is created and put into practice through skills (mainly in English-speaking countries) or competences (the term adopted in Europe). Knowledge comes to be seen as provisional, contextualised, culturally specific, constructed or created by learners rather than discovered, and facilitated by the organised learning situations within a pedagogical process, or by the design of knowledge and skill creation. It would be wise for doctoral students to provide a conceptual description of the previous normative or instructionalists' process compared to the process of Partnership Pedagogy and its design.

A comparative insight would help doctoral students, as well those who will read their publications, to identify the paradigm shift and what has been changed in creating Partnership Pedagogy in the digital age. In other words: how the created educational situations trigger learners' activities, how 'digitalised sand-boxes' better maintain dialogues between teaching and learning, co-operation, and partnership; or, how the chosen design makes teaching and learning mutually necessary and effective for the individual achievements of students and educators. All relevant changes should be

reflected by the content of terms or notions to create an appropriate pedagogical design of the process.

Design is a significant aspect of professional practice in education and a powerful metaphor to describe a unique process of teaching/facilitating and learning. Design can also stand for the phases of the pedagogical process.

> *"Pedagogy, then, involves ways of thinking or knowing as well as ways of doing" (Beethem & Sharp, 2020, p. 1).*

Technologies should be used as knowledge-construction or knowledge-creation tools and shift from learning *from* digital tools to learning *with* digital tools, with learners functioning as designers of their inquiry, supported by educators if and when needed, and the technical devices function as Mindtools for interpreting and organising the learners' personal knowledge and skills.

> *"Mindtools are computer applications that, when used by learners to represent what they know, necessarily engage them in critical thinking about the content they are studying" (Jonassen, 1996, as quoted by Jonassen, Carr, & Yueh, 1998, 1).*

In the digital age, by using digital tools, the basic transversal learning skills (like reading or listening) have expanded their content and now include skills of dialogue in communication, identifying dilemmas and conflicting pieces of information, using relevant sources of argumentation, as well as identifying general human and culture-based values. Another matter for consideration is how partnerships are maintained after the paradigm shift, when subject matter, for educators and doctoral students, has lost its centrality, or, when assessment has taken precedence over other sub-processes.

Meaningful learning for understanding. Mindtools scaffold (a constructivists' notion) different forms of reasoning about content. These require students to think about what they know in different, meaningful ways. To organise students' learning for understanding of content, this necessarily engages them in analytical reasoning and thinking deeply about the causal relationships between ideas. Actually, paradigm shift is practiced to create an appropriate pedagogical process according to new possibilities and requirements.

Digitalisation as an opportunity and digital technologies, in their category of pedagogical tools, have only increased the opportunities for non-formal and informal learning that are contextualised by the standards and programs which are the focus for formal educational settings. A wide range of open educational resources for the development of digital skills and other disciplines, especially for tertiary level, are still under-valued by institutions and individual learners (or unacquired and, therefore, not

used). At the same time, the largely self-directed opportunities and the improvement of autonomous learning are at the core of the new approach, relevant for the learning society and the knowledge-based economy.

The shift of accent from 'pure' knowledge to the individuals' multilateral development, capability, and responsible attitude is imbedded into the idea of competences (knowledge, skills, and attitudes). Meanwhile, there also exists an in-depth analysis and description of skills, and this approach is used in such worldwide projects as ATC21S initiated by the Australian universities in partnership with universities in the UK, Finland, and other countries (ATC21S, 2014). C. Joynes, et al, (2019) provide a wide range of available literature discussing the 21st Century Skills, including several major synthesising studies. The authors point out that within the literature examined, there is general agreement across researchers on the need for new forms of learning to tackle global challenges, because there is no unique and single approach to the definition of the '21st Century Skills'. So, doctoral students will find that useful theoretical sources and descriptions of projects may be developed around either competences or skills. Regardless, the choice of an approach and the usage of one notion or another should be defined, justified, commented on and presented convincingly all through the work.

The project's researchers recommend that doctoral students explore, among many other issues, how short-term academic measures are related to and satisfy the long-term individuals' self-directed learning skills and motivation for continuous, lifelong self-fulfilment, learning with digital technologies and adopting their transformative functioning to learning, working, and living. Assessment should be increasingly digitalised and focussed on learners' integrated knowledge, skills, and attitudes, as well as capturing multiple processes of creativity, partnership, new ways of thinking, and the mind-set that favours ownership of autonomous learning. Digital technologies with analytic functions of learning and teaching should be adopted to support teachers, educators, and learners (OEDC, 2020; Guerriero, 2017).

Capacity of the pedagogical tools. The DocTDL project sought to find at least some evidence in theories and practices as to whether digital transformative teaching-learning or modern didactics performed with digital tools (similar to the automatic use of a pencil or book activities) are more advanced and demonstrate some basic qualities enough to identify a paradigm shift. What features distinguish this process from traditional (instructional, normative) teaching-learning enhanced by digital technologies:

- traditional instruction and learning from digital tools are possible when the use of digital technologies or working in a digitalised environment poses short-term problems that can be resolved by simply providing advice or demonstrating a model for using these tools;

- team work and partnership in doctoral academic studies and research have shifted the focus on learning with digital tools that then make cooperation and knowledge creation successful;
- dialogue and discussions among leaners, learners and educators, as well as other people involved in education are central in partnership pedagogy and focus on learning with digital tools;
- dialogue between teaching and learning maintains the role interchangeability among learners and educators that is reflected by a process design or phases of the pedagogical process.

More answers or pointers are scattered throughout the publications of the project researchers, as well as in the chapters of this book, while leaving room for the doctoral students' individual ideas, vision, approach, and creation of their own pedagogical thinking.

Over the years, researchers have identified and advised on a number of transformations in the approach to learning and teaching being enhanced by e-technologies, mainly in the form of the transmissive mode of teaching, which temporarily limited the transition to digital learning or learning with these tools and failed to remove the 'patchwork' in the formation of didactic models.

Contextualising functioning of the process components. Prioritising feedback, self-assessment, and evaluation, which are crucial components, introduce changes in other components of pedagogical process (setting the aims, selecting the content and tools), integrate the transformed components and inform about their effectiveness and this, in the digital era, will be among the main achievements of doctoral research.

Porter and Reischer highlighted that with an "apparent shift toward complexity-based inquiry in sustainability research", newer methods are being called for to support this complexity-based inquiry in the context of sustainability. Reductionist methodologies are least effective. These transformations call for researchers to move beyond the "standard boxes-and-arrows thinking" when addressing complexity and wicked problems. In this context, complex problems cannot be answered using simple linear epistemology (2018, 1-8).

> *"Nevertheless, there are very good reasons why universities have been around for more than 800 years, and are likely to remain relevant well into the future. Universities are deliberately designed to resist external pressure. … Universities pride themselves on their independence, their freedom, and their contribution to society … because any change that really threatens these core values is likely to be strongly resisted from professors and instructors within the institution. Universities are fundamentally about the creation, evaluation, maintenance and dissemination of knowledge. This role in society is even more important today than in the past" (Bates, 2019, 50).*

Universities operate at a higher level of thinking by following certain principles that distinguish academic knowledge from everyday knowledge, such as logic and reasoning, the ability to distinguish between the abstract and the concrete, or creating ideas supported by empirical evidence or external validation. Universities sustain these values due to highly educated and capable researchers and their academic freedom (Laurillard, 2012; Bates, 2019; Ling, 2020).

The above (or other researcher-selected) conceptual views should be implemented throughout the transformations. Some of the areas of transformation in education are mentioned here, and at least three essential components can be identified in education, each of which has a sub-component of digital transformation:

- the whole education processes of an institution contextualised to the state (or wider) education policy;
- the activities of all educators and students in all processes and disciplines contextualised to the whole process of the given institution; and,
- the overhaul of internal and external relationships contextualised to the whole institutional process, even if the institutional process is working, through specific aspects of its operation.

Does transformative digital learning introduce a new pedagogical paradigm?

The qualitative research, using focus groups, concentrated on sharing experiences between students and educators, explaining and understanding the findings from different perspectives, on narratives and dialogues to explore the priorities of collaborative research, research on transformative learning in overcoming a social crisis, as well as on innovation in doctoral research. The major themes of transformative learning that emerged from the DocTDL data analysis leading to re-examination of research and practice priorities are:

- the urgency of removing uncertainty;
- removing the loss of feelings of security in the digital environment;
- the realisation that the speed of change is tremendous and catching up with it demands some particular efforts;
- the online mode of classes triggers changes in perception, interferes with the time that is needed to think over possible tasks and problems, answers or comments in group discussions;
- the lack of habitual activities when using digital technologies (like switching over to another source of information or activity, combining, etc.) slowing individual and group learning;
- keeping in mind several steps at once that are needed to follow an online discussion.

Other researchers also have mentioned several changes to priorities in digital classes. A qualitative, exploratory case study involving teachers with experience in enhancing pedagogy in an environment of well-established and comprehensive

technology, deliberately sought to transform their practice to introduce personalised digital learning. Three interacting factors were indicated as contributing to the degrees of transformation (Blundell, et al (2020):

- the educators' frames of reference (beliefs and attitudes);
- the habits of mind (prior experience);
- the modes of transformative learning.

The Principal Analyst of Futurum Research Daniel Newman distinguishes between six pillars of digital transformation (Newman, 2018); these are modified to be relevant for education:

Experiences - the positivity of the experience has the potential to make or break the productivity and effectiveness of activities, including learning.

People - the most critical part of the six pillars of digital transformation. The key is to use digital technology to create meaningful experiences that reach learners, researchers, and practitioners on a deeper level – still connecting human to human.

Change is inevitable – and it might be tough; to address this develop a strategy, provide the necessary tools and environment for educators, learners, and researchers to embrace and succeed in this change.

Innovation requires space for open communication, collaboration and the freedom to create. And, innovation should be constant, it drives the digital transformation forward by allowing for cooperation and partnership in an open space for problem-solving.

Leadership should be proactive, not only be involved but as technology moves quickly, there is no time to lose. Create order, instead of going with the flow. Carefully examine all options. Think differently than the rest and lead others to take the same approach to investigation and implementation. Don't just follow the digital transformation crowd – doctors are supposed to lead it.

Culture – transformation cannot survive without the right educational and business culture, where people matter the most, change is planned for and innovation takes centre stage, with these the formal educational process will turn into a culture that simply transforms on its own.

These are not all items that should be addressed the paradigm shift in pedagogy, mainly some hints are provided and a space for doctoral student ideas and vision is left; nevertheless, pedagogical paradigm shift can be summarised:

- from reductionist approaches in education research, that uses linear methods and reduce complex phenomena into elementary parts, to investigation of complex phenomena and concept-creation that are the basis of transforming an education system;
- this research approach is in line with the shift from learner-centred to learner-learning processes;

- traditional ‘active’ learners’ individualistic participation and being involved to activities in collaborative groups and a holistic approach in partnership;
- from a specific skills-domain to digital pedagogical thinking, from the academic studies-domain to the research domain;
- from the traditional sequence of educational procedures in formal education to a sequence dominated by self-assessment and peer-assessment that changes the logic of formal pedagogical processes and challenges new models;
- the paradigm shift as a conceptual change of education and the pedagogical process is achieved through appropriate transitions between the components that constitute the education system, pedagogy as theory and the practice of formal education.

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4.2. FROM KNOWLEDGE TO KNOWING AND THE WISDOM OF PRACTICE

4.2.1. The Challenges of Digital Transformations

Possibilities should not be limited. These are users' knowledge and skills that are limited. This chapter offers some considerations on the further learning of educators and doctoral students in order to increase their ability to close gaps in tertiary education and facilitate the transformative learning of doctoral students in the context of the university's mission and the relevance of the transition. University students and educators in all nations are under pressure to develop positive and productive technology-related skills and outlooks, transformative digital learning is one among many since Global processes are transforming learning and work. Organisations and companies are entering a deeper phase of digitalisation, incorporating the newest technologies such as machine learning, smart sensors, virtual/augmented reality, the internet of things, big data analytics, etc.

The potential of digital technologies in university education has not been fully exploited at least for four reasons:

a) digital technologies are rapidly evolving that happens apart from the curricula/programs and disciplines; program development and equipping research is a special energy and time-consuming activity of well-prepared, knowledgeable, and wise educators who have to investigate the technological developments and translate them to pedagogical terms;
b) the field of education is inappropriately slow to adapt the offered possibilities to the specifics of the pedagogical process; despite the fact that technology development is rooted in education, this process happens mainly apart from the learners;
c) efforts of the education institutions to anticipate the development of technologies are negligible, despite the fact that it is education that underpins and makes possible the development of production and technology that is pushed ahead by income and not by education;
d) the product created on the background of education and knowledge is used in the economy without a backword connection with the field of education, or the field of education participates weakly in the further use of this product.

The great majority of digital technologies are poorly attuned to pedagogical purposes. At the same time, there is no one who can identify when and how this world is going to change, only a few general predictions are possible coupled with wisdom. This means that facilitating the transformative learning of students starts with the educators' and doctoral students' pedagogical thinking and judgement informed by knowledge, and wise decision-making.

The theoretical analysis and empirical data collected by the DocTDL project (see the project publications), the case studies that are not limited by those described in this book, and theoretical considerations related to digital transformative learning allow us to point out at least some topical issues to suggest emphases and issues for doctoral research, specially related to digital transformative learning.

Teaching online means facilitating, conducting, and assisting studies and research almost entirely through the internet, initiating discussions and group activities via several systems like Skype, Zoom, Webex, mobile APPs, Team-building, etc. These systems replace traditional settings, dictating the possibilities, which differ from a traditional didactic process even if the latter is to some extent supported by digital tools.

These tools change the online process of teaching/assisting and learning by modifying all of its components and the whole cycle of the pedagogical process. Meanwhile, fundamental stability is provided by the theoretical basis of *The Activity Theory* (it does not exclude addressing other related theories) and, in particular, the transitions of a pedagogical process – teaching and learning are kinds of activities.

Doctoral students and their scientific advisors usually encounter different approaches to one and the same phenomenon. Digital transformative learning is not an exception; vast and deep discussion is an effective way out. For instance, investigations into whether digitalisation can be leveraged so that learning is facilitated and accelerated in student-centred, better in student-learning-centred learning, found that although schools are turning to computing as the solution, when 'each learner has a computer', this event if not supported by pedagogical tools, fails to lead to transformative change of 21st century skill acquisition and to deeper learning competencies. Here is space for didactic of higher education in digitalized world by maximizing learner self-conducted learning and doctoral research capability.

A step-by-step approach helps manage the transformation of learning and teaching. Digital transformation of learning takes place under the influence of technology, but conscious, meaningful and therefore self-directed learning can achieve maximum effectiveness at the doctoral and also educator level. Self-directed learning and competence development can be implemented in several ways. Let us return back to the T3 alternative offered (Magana, 2017) that distinguishes between at least three qualitative stages or kinds of teaching and learning with digital technologies and challenge viable methods, when deliberating digital change for teaching and learning in education institutions. These might help educators and doctoral students identify stages of self-directed learning, the zone of proximal development, as well as choose pedagogical provision for student deeper and less time-consuming learning:

- At the lower-level *translational* use of digital technology helps educators and students perform routines and save time; actually, doctoral students and educators nowadays, especially if they have successfully switched over to a fully online process during Covid-19, have acquired the skills relevant for

the translational level. However, this statement can only apply to existing, functioning, and in many cases limited kinds of technology until new technologies and tools have emerged and need to be translated, firstly, to understand these as such and, secondly, to identify their pedagogical potential.

- *Transformational* use of digital technology reflects on the previous achievements to generate new opportunities and individual traits. This is a non-stop process of transforming the university process, learning, teaching, research, evaluation, cooperation, the individual competencies of educators and students, etc. – all that constitutes learning and living with digital technologies. Doctoral students span this level and should be ready to attain the traits of an expert even if the field of education is vast with multiple possibilities of creating diverse pedagogical settings. Within all this, there is a positive message: opportunities for the individual development are unlimited.
- *Transcendent* use of digital technologies exceeds the usual limits, surpassing, or extending the limits of ordinary experience, having the traits of an expert, which surface in research and academic activities such as supporting students' research, analysis and vision of how to further develop processes, and a passion for greater contribution to their local and the expanded global communities. Transcendental qualities might help educators to forecast the further development trends of digital technology and their particular field of science. Again, this is a positive message – the future possibilities can enter the curricula.

Indeed, the theories and researchers mentioned above, identify these stages through methodology, levels of quality, types of digital learning-teaching, and investigation. According to this perspective, university studies are not the only way to improve digital transformative learning. Learners, doctoral students, especially educators can develop a level of usage higher than transformative. There may be other investigations that allow us to look at this phenomenon from a different perspective, further develop the transcendent use of digital technologies, and find ways of connecting studies with the introduction of new technologies in production; in other words, not to break the university and modernization of production processes. Doctoral students should analyse the approaches to select and determine the most appropriate ones.

Strengthening human-machine and human-web dialogue. In education, human-machine dialogue is mediated by pedagogy and assigned to serve it despite the fact that not all digital machines and other devices are created for educational purposes. Increasing levels of hands-free technology (e.g., computers, internet, mobile devices, wearables, software applications, social media platforms, and virtual reality gear) if

investigated separately or apart of pedagogical provision and functioning, would make the research, as well as academic and even practical studies fragmented. The theoretical analysis of the DocTDL project has shown some evidence of human-machine and human-web dialogue, which supports the assumption that the digitalised environment and devices

> *"transform the technical requirements for learning and work activities compelling university students in all fields to develop positive attitudes toward using and learning about technology" (Adolph, Tisch, & Metternich, 2014).*

Drawing on the theoretical considerations of *The Activity Theory* and the nature of active learning where 'activity' demonstrates the intensity of action, five essential principles for modern interactive and participatory teaching and learning should be considered as relevant, even if these were identified two decades ago (Bransford, Brown, & Cocking, 2000). These are: building on previous experiences, learning as a social activity, meaningful contexts, connected, organised and relevant content, feedback, and active evaluation.

During the pandemic digital technology, with its greater availability and common use, challenges the pedagogical considerations needed to utilise these tools, to handle the issues that may be encountered, and even interpret the ability of digital technology to generate solutions, rather than human thinking. Education researchers have come across the term 'computational thinking' - a set of problem-solving methods that involves expressing problems and their solutions in the way that a computer may execute these (Wing, 2008).

Before addressing the term 'computational thinking', educators, who are learners first, need to understand that its content is variable. As M. Romero et al. (2017, 1) put it: the creative use of digital technologies to solve problems is also related to computational thinking as a set of cognitive and metacognitive strategies in which the learner is engaged in an active design, creation process, and mobilised computational concepts and methods. The boundaries of computational thinking vary among authors. This poses an important barrier when it comes to operationalising computational thinking in concrete activities.

Educators should transform computational thinking into pedagogical thinking with digital tools and use these to assist the learners' acquisition of computational thinking for possible usage in their current or future work – the path may be similar to how educators develop pedagogical thinking:

- learning how to use spoken, academic, and technical (especially computational) language effectively as a cultural, pedagogical, and psychological tool trying to exclude language distortions;

- practicing cooperation, team-work, interactive teaching-learning, cooperation in research, dialogic pedagogy, partnership in research when operating online;
- making notes about mistakes and planning to correct language and pedagogical/ educational terminology, as well as comments on usage of digital technology;
- integrate curriculum learning with wider authentic areas of knowledge and skill functioning by using digital technology to integrate pedagogical and culture-based terminology;
- use other strategies to improve your dialogue with digital technologies and tools.

The priorities of digital technologies are described and well-known to educators and students. It is only through the practise of a totally online process that results in highlighting some crucial peculiarities that demand different pedagogical provisions of attention, perception, and face-to-face contact, exchange of emotions, cooperation, and feedback. All of this needs some time to come to an understanding of what and how these possibilities match the aims and motives of learning and teaching, as well as a way of constructing an appropriate pedagogical process. It might seem like a paradox: preparing university classes with limited equipment and poor skills in its usage, especially maintaining discussions by using technology, may appear more time-consuming than the traditional modes of teaching-learning. More time and energy are required for educators to read the students' written responses, as well as providing responses to the students' work. Here again opens a pool of problems to be investigated.

Digital technologies are enabling objects, devices, and human-machine systems with new physical, sensorial, and cognitive capacities for addressing complex tasks (Romero et al. 2017). In digitalised environments, humans and machines will increasingly function together as *'intelligent assemblages'* capable of producing knowledge more efficiently, reliably, and adaptively than when functioning alone.

In pedagogical settings, however, educators and learners have to take into consideration the limited options for learners to absorb the outcomes of the computer processes, as human activity makes sense when it is conscious and understood by the human who is the actor.

> *"As global processes of digitalization increase the proximity and interdependence of humans and machines, attitudes toward IT become vital indicators of student readiness for successful learning and work" (Mykhailenko, Blayone, Ušča, & Krasovskyi, 2020, 22).*

Hybrid classes are preferable. Educators and teachers, even students and pupils report that they miss face-to-face contact, direct communication, the benefits of socialisation - all that is characteristic of humans and is offered abundantly but not appropriately used in the traditional mode. Therefore, they vote for mixed learning where on-site and online communication, context-creation, learning management technologies, and cooperation are interchangeable. The opportunities that are open by digital technologies change the learning environments, networked learning introduce new education paradigm (Jones, 2015), and create new 'sandboxes' (vanOostveen, et al., 2016) for cooperation in learning.

Another paradox is the perception of space. In school and university classes, the usual learning environment has a sense of more learning and connectivity space, while online classes take place at home with dialogue taking place via and with a computer – the screen opens the wide world, gets together lots of participants at the same time it interferes with the individual perception and creates the image of a limited environment.

New environmental possibilities and impacts challenge us to re-focus on pedagogy at all levels of education, including studies in higher and doctoral education, seeking the 'who', 'what', 'how', and even 'why' of online teaching-learning have particular priorities and restrictions, when role interchangeability is effective, how to amend the space effects, make use of the peculiarities of perception, etc.

The two basic activities – learning and teaching/assisting, which constitute the process of institutional education, need to be deeply transformed, including the tasks and materials prepared for students; in parallel, they are transforming educators' digital and pedagogical thinking and further learning.

Different viewpoints of the definition of tertiary learning and teaching/facilitating trigger different approaches to providing assistance appropriate for each particular level of education. Assorted concepts used by researchers to define pedagogical phenomena continue to invite discussion.

For instance, reflections on development and learning has focused the researchers' attention to the term '*learning development'* (Hilsdon et al., 2018). The Association for Learning Development in Higher Education (Briggs, 2018) discusses what '*learning developers'* need at a particular level of education – 'learning developers' is used as a synonym for educators, teachers, librarians, or technologists who are involved in the pedagogical provision and education in general. As part of the implementation of *The Action Theory*, learning development pedagogy is becoming increasingly prominent and would undoubtedly enhance a practitioner's capacity to adopt a learning development pedagogy, however, it does not automatically make an individual a 'learning developer' (ibid).

Over the last fifteen years, the pedagogy of learning development has become increasingly established within UK universities and Centre for Excellence in Teaching

and Learning (Hartley, et al, 2010) following the intellectual traditions different from that of the continental Europe, including Latvia. Practitioners, nevertheless, can find plenty of common methods and strategies that can meet the practical needs of the educator, if they make choices that fit within their approach or intellectual tradition and are coherent with the educator's pedagogical system.

Here is the right spot to clarify the terms for the purpose of doctoral research, and remind about the intellectual tradition of pedagogy practised in Latvia that includes the developmental contribution of learning alongside education and educative targets (integrated three-part aim of education and pedagogy). Also, learning, like any action or activity, is a basis for an individual's development; this activity being culture-related has local qualities.

Researchers will discover even more particularities, triggered by the advent of digital technologies and online learning modes, as well as comparative studies on theoretical approaches and intellectual traditions. Among these there are valuable conceptualisations of education as a field of study through the presented different traditions, a comparative investigation of the experiences of several countries, and

> *"... an ambitious effort to characterize at a global level the current condition of the field of education research. I do not know anything quite like it in the literature." (Labaree, 2017, 277).*

This is how professor at the Stanford University Graduate School of Education David F. Labaree in his review rated the book on different approaches to education studies prepared by an international team "Knowledge and the Study of Education" edited by Geoff Whitty & John Furlong (2017).

Comparative studies and adopting of the most effective experiences will empower research and formal education, suggest the best ways of combining online and face-to-face classes; all possible findings and conclusions should be focused on the learner possibilities, well-being, and benefit.

4.2.2. The Gaps Between Research and Practice

Research should close a theoretical and/or practical gap. The goal of the DocTDLL project was to create new pedagogical knowledge and technological know-how in the field of transformative digital learning in higher education in Latvia to close the related to transformation gap. It started with the experience of EILAB, Ontario University, Canada and investigation of digital transformative learning, to ensure the transfer of knowledge and skills in the further development of the doctoral study program for Education Sciences, with a focus on Pedagogy and unlimited possibilities

of other focuses (the tradition in Latvia), and the development of the scientific, academic and practical capabilities of researchers and educators.

This goal has enabled educators, researchers, especially doctoral students, to analyse the developments in *The Theory of Knowledge-creation/generation*, *The Activity Theory*, *The Complexity Theory* and others related to research theories and practices (more information is available in the publications of the project's researchers and in the up-coming Ph.D. dissertations). New experiences bring about new tensions related to comparative research and the implementation of new ideas or practices. Each national case study demonstrates some intellectual traditions and characteristics of knowledge that are specific to a particular cultural context. All of this obliges researchers to take into consideration the cultural contexts and make the borrowed innovations fit the national intellectual traditions of pedagogy and the field of education, provide further developments.

The list of gaps shows the tendency by researchers to focus usually on the positive impacts of digital technologies, while the potentially damaging impacts of rapid digitalisation are less investigated and assessed. At the very least, the balance between gains and potential losses is not maintained. It would of more benefit for educators and students, if a researcher's findings were to highlight the positive outcomes of using digital technologies along with the presence of possible negative impacts, as well as ways of how to maintain the balance or at least avoid the negative impacts and by doing so strengthen the researcher's responsibility. Tensions are noticed and the related problems tackled by the doctoral research as part of the university's or research institution's investigations. The gap clusters shown here are only those that have been revealed by the theoretical analysis and empirical investigation by the DocTDLL project.

University mission and innovations. Closing the research-practice, theory-practice, and the knowing-doing gap is an on-going problem in education that becomes especially topical when influential social changes take place. It focusses primarily on promoting the implementation of the research findings to improve educational practice at all levels and forms of education.

The first well-observed gap is usually that between the already existing mission of the university, followed by the paradigm of education, pedagogical approach, methodology, etc. that is quite a sustainable experience, on the one hand, and the innovation, on the other, which calls for major changes to the whole university system – bulky research that would require several coordinated research teams.

Within this complicated system, a doctoral student, as a researcher, has to choose the appropriate scope, paradigm, theoretical approach, the methodology to be either changed or improved, preferably in the context of a university investigation. Currently, the complex changes of the social processes insist on cooperation and even partnership

in doctoral research, for instance, the bulky process of the empirical data collection is completed in cooperation while their interpretation is an individual affair.

Flexibility and agility of universities. Considerable gaps in education are being generated by the slow implementation of knowledge and skill development, especially in humanities. For example, a decade before the pandemic, the need for a new approach to scientific method was highlighted. This required acknowledgement of problematic elements around "metaphysics, value, and political assumptions inherent in the aims of science …" The social sciences and humanities must be transformed in such a way that they take on the task of helping humanity to incorporate this new concept of rationality into the structure of social life, in all our human endeavours (Maxwell, 2008, 2).

The words "flexibility" and "agility" have become catch cries of universities in the 21st century, but in many cases, they have been words in a strategic plan … with vague meanings attached to them. The 21st century has created conditions that go beyond slogans, where universities have the opportunity to use research as a means to complement societal knowledge and common wisdom, and university academic experts have the advantage of being able to use their relative independence to manipulate and to manage existing knowledge in hitherto untried and unknown ways when crises demand such approaches (Ling, 2020).

Priorities of decision-making over decision-taking. For many people the pandemic crisis is all about doom and represents a major threat to the system but for visionaries and risk-takers these represent opportunities for real, meaningful change. Not change, which is forced upon decision-takers but change that is realised by decision-makers. Universities are in for major overhauls in the global context while those that educate teachers and investigate problems of education have to cope with their problems within a domestic frame – education to a large extent is related to the local culture and language, even if it experiences global impacts (Devinney & Dowling, 2020).

One of the most pressing challenges in education that requires immediate implementation, is combining the efforts of universities and companies to prepare specialists of high quality. The increasing possibilities for educators and students to participate in decision-making are apposite for the digitalised nature of work and studies. Blayone & vanOostveen (2020) provide a summary of the major characteristics of work and studies. This serves as a good introduction to doctoral students for analysis of the current transitions of universities and the appropriate transformations of studies and research.

Education researchers, educators, and doctoral students should consider the concepts of inclusion and involvement to compare these with a more current concept of participation. The latter might be more appropriate for the new reality and be a better match with the characteristics of the digitalised environment, work, and learning if coupled with growing autonomous decision-making.

Re-thinking of pedagogical provision. Meanwhile, a tension that penetrates the field of education and requires a re-thinking of pedagogical goals is a particular disagreement about what social goals higher education and doctoral studies should serve, when addressing the development of university theoretical knowledge and the practical skills of their graduates needed for companies. A special case is implementation of research findings and theoretical knowledge.

Despite a stronger accent on practice, improvements are impossible without appropriate knowledge. The current available publications are part of an attempt to build a new knowledge-based theory of teaching and that of education organisation to explain the dynamic process of knowledge-creation or knowledge-generation and utilisation.

The present interest in this is created by digital technologies and the digitalisation of companies and universities.

> *"An organization is not an information-processing machine that is composed of small tasks to carry out a given task, but an organic configuration that is conceptualized as a shared context in motion, can transcend time, space, and organization boundaries to create knowledge".* This innovative shift reminds: *"the researchers need to understand that the knowledge-creating process is a transformation through which individuals, groups, and the whole organizations transcend the boundary of the old traditions, settings, structures, hierarchies, decision-making, etc… into a new self by acquiring new knowledge" (Nonaka & Toyama, 2015, 95-96).*

The flexibility imposed by technology changes educational settings and accentuates the need for adequate pedagogical reflection, principles, and practical solutions that are expected by practitioners. Changes in/of one component of a pedagogical system triggers a shift in the whole system – this must be reflected in research findings to help teachers and educators adopt the innovations.

Knowledge vs knowledge. University researchers do create new knowledge but there is a time and energy-consuming mediating field where users should be prepared to use this knowledge. An unresolved gap triggers further tension between knowledge that is embedded in the context of educational practice and knowledge that is abstracted from this context (Labaree, 2017, 279). The problem is whether educators produce and own (maintain) some amount of quality knowledge of practice and skills directly in practice, or whether this knowledge is created/generated by research in a different from practicing area and as a product of research is transferred to students.

How, then, is the path between studies or research and implementation made as short as possible? The question focuses educator, researcher, manager attention to the

balancing of theoretical and practical knowledge, learned at universities skills and those learned in practice.

Still, a tension between different ways of organizing educational knowledge do exist.

> *"One approach sees the field of education as consisting of a multiplicity of individual university-based knowledge disciplines (sociology, psychology, economics, philosophy, history), each of which is bounded by and imbued with the spirit of that discipline. From this perspective, the field is multidisciplinary in nature. The other approach is to see education knowledge as a discipline of its own or as an interdisciplinary arena for exploring the institutional setting…" (Labaree, 2017, 279).*

Interchangeability of roles and responsibility. The speed of activities that provide opportunities for flexibility and self-directed learning moves emphasis from the educator's responsibility to one shared with students and the interchangeable roles of educators and students, when educators themselves become learners and increasingly share the space allocated for team learning.

Digitalisation decreases the physical and cognitive distance between educators and learners, universities and companies, countries, cultures, researchers, humans and digital machines requiring workers and learners to possess a positive and trusting disposition toward technological entities (see more in Blayone et.al, 2020). This peculiarity spreads to emotional reactions to learning, which prioritises doing, therefore, demanding a new educational process at the core of the whole university system. The content of education is being re-structured to make borders between the subjects looser and to close the gap between knowledge and knowledgeability, knowing and doing in new or even unexpected situations, as well as to demonstrate synthesis of the three Cs: creativity, communication, and collaboration.

Pedagogical gaps appear in the relationships between those who are involved in education settings with traditional hierarchical systems that are being crowded out by the digital teaching-learning, on the one hand, and more space for learner participation, autonomous learning, and educator autonomous decisions being allocated – on the other. This space should be provided by educators. The research has to re-define answers to the three traditional and interrelated questions about any shift applied to a pedagogical setting to close this gap:

- as the relationship between 'the old' and 'the new' (why) or
- between the sustained modes of implementing intellectual traditions and new modalities to make these traditions (what) come alive through changed practices,
- making knowledge grow into knowledgeability, and capability (how).

Different visions and traditions for the benefit of students. Different cultural traditions meet in the open digital world, for example, different definitions of 'competence' and 'skills', as well as many associated ones even among the EU countries, reflecting different intellectual traditions according to the cultural environment in which they occur and with which they are in line. Any innovation, therefore, and its implementation suggested by researchers must be clearly described and theoretically grounded in local traditions, as well as demonstrate open spaces for intercultural exchange. The breakdown of the traditional education system highlights serious gaps, which if not closed, delay or damage pedagogical processes relevant for the digitalised age. The basic difference (as well as many others) is defined by the publication that was prepared under the auspices of UNESCO (Keevy & Chakroun, 2014). It demonstrated important examples of different levels of learning in a hierarchy:

a) the work of Benjamin Bloom and discussion on the revised Bloom's taxonomy of learning - a more behaviouristic conception of the operationalisation of learning outcomes;
b) the SOLO taxonomy with a more constructivist orientation (Biggs & Collis, 1982).

More recent move to greater transparency of the categories used in research and practice to close the gap in recognition is the new Europass model introduced in Europe. It makes skills and qualifications more understandable and comparable by combining four standardised documents that can be submitted in e-format: Europass CV, Mobility, Diploma Supplement, and Annex to the Certificate of Acquired Education.

With so much confusion and anxiety, education experts try to make remote learning as simple as possible. It gets really hard to navigate if every educator is using a different platform. For distance learning, experts say, time needs to be skewed more heavily towards interactive and active learning, with less time spent on teachers lecturing over Zoom. As so many students are feeling a sense of isolation right now, using the on-site time in any way to facilitate the interactions that they've lost is going to be really helpful. Such use of time can not only enhance student engagement, but also improve academic outcomes and performance (Lynch, 2020).

Digital learning technology, and the discourse around it, is moving so fast that even the latest careful, well-intentioned books can already seem somewhat dated. The books published on massive open online courses (MOOC) share a sense of crisis in higher education—of swiftly changing economics, technology, and social context—and of an urgent need for education reform. Yet the argument that digital learning technologies, their availability, and access to publications will solve the crisis in higher education is far too facile an expectation (Christ, 2017).

Knowledge-creation and capability to create and utilise new knowledge should be seen as a possible basis and a source of benefits for universities or a company in closing the knowledge-practice and knowing-doing gap in a digitalised era. Closing the gaps does not require propping up or adding something more rather it requires a non-stop process of knowledge-building/creating/generating and implementing on the basis of a goal-directed and student achievement-directed activity.

4.2.3. A Focus on Wisdom

Why wisdom? When evaluating educator activities during the intensive transformation requiring wider use of digital technologies in higher education, now amplified by the pandemic, acknowledging the wisdom of teachers, educators, and students as being at the core for solving complicated and unexpected problems does not change. As S. T. Coleridge puts it *"Common sense in an uncommon degree is what the world calls wisdom."* This mobilises knowledge, skills, capabilities, and attitudes to solve the most complicated internal and external problems of formal and non-formal educational settings. The decision to include a chapter on wisdom is based on several considerations:

a) In this rapidly changing environment of digitalised learning and existence, when confusion has entered the human arena and causes uncertainty in education, wisdom prevails and provides a dominant lens for looking at academic, practical, or professional activities.
b) Citizens are brought up on the wisdom of life as expressed in their country's folklore. This was used as a philosophical foundation in Latvian education by such minds as P. Birkerts, among others, who considered wisdom the gospel of people's work and life, and S. Hessens who defined pedagogy as a philosophy-in-use.
c) The recognition that every teacher and educator, as well as each doctoral student, alongside their academic knowledge, has at least a rough understanding of wisdom and tries to apply this quality to generate the best possible judgements and activities for the best possible achievements.
d) Multiple approaches to the phenomenon of wisdom provide a basis for considering wisdom in its plural manifestations throughout educational settings broadly, including the transformation of digital technologies into efficient learning and effective pedagogical tools.
e) Researchers, when analysing the theoretical contribution and practical suggestions of others, use their wisdom to ensure that the outcomes of the research are the most beneficial ones and share their vision on the research problem to initiate a dialogue and thus generate new knowledge or simply facilitate learning.

Wisdom defined. Wisdom has been defined in many different ways, in different cultural traditions but always in contexts with ethics and responsibility as the characteristics attributed to wisdom.

> *The ability to apply relevant knowledge in an insightful way, especially to different situations from that in which the knowledge was gained. (Wisdom meaning. Your Dictionary. 2021. Retrieved from https://www.yourdictionary.com/wisdom)*

Wisdom is the ability to think and act using knowledge, experience, understanding, common sense and insight. It is associated with attributes such as unbiased judgment, compassion, experiential self-knowledge, self-transcendence, non-attachment (Grossmann, 2017, p. 2), and virtues such as ethics. N. Maxwell (2008) advocates that universities ought to alter the focus from the acquisition of knowledge to seeking and promoting wisdom of educators and students that can be defined as the capacity to realise what is of value in life, for oneself and others. This is of a special importance when new knowledge and technological know-how increase our power to act and our knowledgeability. This, if crowned by wisdom, makes new knowledge function for the human good, while without wisdom, knowledge and technologies might do harm to individuals, society, or the natural environment.

Obviously, this trait is characteristic of people as long as they live and behave like people. The Book of Wisdom was written long ago, about fifty years before the coming of Christ (https://bible.usccb.org/bible/wisdom/0). So far it has informed educators and researchers of the significance of the phenomenon of wisdom. Might be, wisdom is not the quality only of humans, but it is the quality that humans must hold and practice.

Glück, J. (2017) reminds us that practical wisdom, which is the most important for the teaching profession is much more accessible, although it has very seldom been an object of discussion, at least during the past fifty years. Publications provide several major definitions of wisdom, but there is no single all-inclusive definition that embraces all important aspects of wisdom (Jeste, 2010). It is difficult to define this phenomenon but one can easily notice the absence of wisdom in the everyday life of people, as well as in education and research.

Nevertheless, teachers and educators have at least some vague senses of what this notion and phenomenon means. For some wisdom is conceived of as an expanse of knowledge, others think it is a practice that enhances this trait in people.

Human wisdom is a complex phenomenon. The project's (DocTDL) researchers did not investigate wisdom, but from time to time came across evidence of it, so some reflections about it are provided with the hope that some of the doctoral students will choose it as the object of their research, or, at least remember that wisdom provides a lens for looking at pedagogical provision.

The world is currently experiencing positive and negative impact from amount of technologically equipped, successful, as well as self-interested, and profit-oriented people. Impacts of the latter threaten the long-term viability of human life. Being able to self-evaluate one's wisdom might well be essential for alerting people and society to significant mistakes.

At the individual level wisdom is about positive personal traits, an individual's capacity for love, courage, interpersonal skill, aesthetic sensibility, perseverance, forgiveness, originality, future-mindedness, and high talent. At the group level, it is about the civic virtues and the institutions that move individuals toward better citizenship: responsibility, nurturance, altruism, civility, moderation, tolerance, and work ethic (Baltes, Glück, & Kunzmann, 2002).

Wisdom is more than knowledge though it cannot exist without knowledge. It is more than simply practice, as well. While there is no one clear definition of wisdom that at least the majority of researchers or practitioners agree upon, several concepts are suggested based on common sense. Academic researchers, when investigating wisdom, attempt to clarify its constituent parts. Some of these have been identified by Ardelt, M. (2011); Santos, H. C., Huynh, A. C. & Grossmann, I. (2017); Glück, J. (2017).

Amongst the above-mentioned researchers there is no single agreed-upon understanding either, but they share their current understanding of the nature of wisdom, which is comprised of certain attitudes, value-based ways of existing, perspectives, and interpretive frameworks that can be called approaches to seeing wisdom. The conceptual focus of the authors' approach is to conceive of wisdom as expert knowledge. Specifically, wisdom is viewed as a highly developed amount of factual and procedural knowledge and judgments dealing with what the authors call the 'fundamental pragmatics of life' - an important but unclear issue regarding life, which involves knowledge and judgment about the course, variations, conditions, and meaning of life (Trowbridge, 2011, 4-5).

In order to understand the nature of wisdom, as it is viewed in psychology, modern scientific thought, in general, must be understood. If contemporary psychology admits to wisdom at all, it is practical wisdom, which is more appropriate for education. Definitions of wisdom are categorised in one of four ways: (1) a composite of personality characteristics or competences, (2) positive results of human development, (3) a collective system of practical knowledge, and (4) a process that emerges in real-life contexts (Trowbridge, 2011, 2-3). Many ways of defining wisdom are based on different approaches and foci and at least some of them demonstrate parallels with competencies and capabilities. This leads to a couple of notions:

a) Competence represents an unfinished nomenclature of the stages in a professional's development and should be followed by the highest stage – expert wisdom.

b) Another idea suggests that the trait of wisdom can be found in any human activity. When doctoral students or educators know more about wisdom, they can develop this quality on their own. Anyway, there is space for deep investigation, powerful knowledge and a creative mindset.

Five wisdom-related criteria are reported (Baltes & Smith, 1990); these are:

- rich factual knowledge about the fundamental pragmatics of life;
- rich procedural knowledge about dealing with the fundamental pragmatics of life;
- life-span contextualism - understanding of life contexts and their temporal (developmental) relations;
- value-relativism - knowledge about the differences in values and life goals;
- uncertainty - knowledge about the relative uncertainty of life.

Monika Ardelt, Ph.D., professor of sociology considers that wisdom exists only in individuals and that it should be measured by assessing the difference between intellectual and wisdom-related knowledge in the areas of goals, approaches and acquisition. It is argued that wisdom rather than intellectual knowledge is crucial even if 'a critical element of wisdom is the desire for learning and in-depth knowledge' (Ardelt, 2011, 279–291). Researchers (Ardelt, 2011; Jeste et al, 2010) have pointed out three primary dimensions of wisdom:

a) cognitive - ability to understand a situation thoroughly, knowing the positive and negative aspects of human nature, awareness of life's inherent uncertainty, yet the ability to make decisions despite this;
b) reflective - ability and willingness to examine phenomena from multiple perspectives and the absence of projections or blaming others for one's own situation or feelings; and,
c) affective - positive emotion and behaviours with the absence of indifferent or negative emotions toward others and remaining positive in the face of adversity.

Based on an analysis of literature Igor Grossmann, Ph.D., associate professor of psychology at the University of Waterloo, Canada, where he leads the Wisdom and Culture Lab, contextualises wisdom with wise thinking (Grossmann, 2017a; 2017b) and has concluded that in the face of ill-defined or uncertain life situations, wisdom involves certain cognitive processes affording unbiased, sound judgment like intellectual humility and recognition of one's own limited knowledge, appreciation of broader perspectives, sensitivity to the possibility of change in social relations, and integration of different perspectives.

Wisdom is an achieved quality. Therefore, education might play a significant role and help learners responsibly navigate the web. Researchers (Grossmann, 2017; Santos et al, 2017) highlight the fundamental role of contextual cultural factors, experiences, and social situations for understanding, development, and propensity of showing

wisdom in educational practice. Here are some of the foci used for definitions of wisdom that fit the current situation in education and pedagogy best of all, as well as help drawing out the similarities and differences with competence:

- Wisdom is the ability to use one's knowledge and experience to make good decisions and judgments based on what a person has learned from the experience, or the knowledge and understanding (Cambridge Dictionary);
- The ability to deal with the contradictions of a specific situation and to assess the consequences of an action (Jeste et al, 2010).
- The ability to think and act using knowledge, experience, understanding, common sense, and insight. It is associated with attributes such as unbiased judgment, compassion, experiential self-knowledge, self-transcendence and non-attachment; intellectual humility, recognition of uncertainty and change, enabling responsible usage of knowledge (Grossmann et al, 2017).
- The capacity of: judging rightly in matters relating to life; soundness of judgment in the choice of means and ends; sound sense, especially in practical affairs. It is the capacity to have foreknowledge of something, to know the consequences (both positive and negative) of actions or behaviours (Oxford English Dictionary).

Literature highlights questions about (a) the essential components of wisdom, (b) its structure (e.g., the relative importance of different types of knowledge), and (c) how wisdom is acquired. It also sets out the difficulties involved in trying to identify universal personal qualities, values, rules of conduct, or path-ways to wisdom-related outcomes (Baltes & Smith, 2008, 117).

Wisdom is achieved when in a concrete situation a balance between intrapersonal, interpersonal, and institutional interests can be achieved (Jeste et al, 2009). It functions in regulating the successful development of humans throughout their lifespan (Baltes et al, 2002). Wise thinking and responses to challenges vary from one situation to another, within self-focussed contexts. Specifically, an ego-decentring cognitive mindset enables wise thinking about personally meaningful issues when experiential, situational, and cultural factors are powerful in shaping wisdom than previously imagined (Grossmann, 2017).

There are no quick answers to the questions on measuring wisdom, but the value of wisdom is widely recognised. Teacher and educator reflections provide a rich and diverse array of thoughtful responses to questions on wisdom that are intended to educate the human mind and inspire the human spirit. Among the many approaches and visions that make investigation of it complicated, there is an extremely significant statement: wisdom can be developed intentionally; it can be learned (Glück, 2017). Long ago, in the depths of human history, Aristotle reminded us: "Knowing yourself is the beginning of all wisdom." (https://www.goodreads.com/quotes/tag/wisdom).

It is possible to learn wisdom or being wise in at least three ways:

a) by learning its nature that demonstrates different foci,
b) by learning how to be wise, as well as reflecting on one's self; and.,
c) by analysing successes and failures.

> *"Observable indicators of wisdom-in-action include such verbal behaviors as exceptionally good judgment; good advice; insightful commentary about difficult and uncertain matters of life; and nonverbal behaviors associated with good conduct, emotion regulation, and empathy in interpersonal and group contexts (Baltes & Smith, 2008, 119).*

Learning to be wise is not a simple collecting of knowledge, nor is it a trained skill; wisdom is related to expert knowledge (Ardelt, 2004). In the Latvian intellectual tradition of pedagogy, the educative, non-cognitive aspect and contribution to individual and social development have been emphasised and pedagogy conceived as philosophy-in-use (Hessens, 1929) while 'training' means repeated operation. In order to follow this intellectual tradition, researchers should look for this quality by consciously using their knowledge, skills, and attitudes, the synergy generated by competence and capability in a particular situation and achieved through the enhancement of inherited and acquired traits.

Wisdom is not an absolute personal quality. Not all of the qualities and aspects that have been mentioned here must be present to an equally high degree in each person who one can consider as wise. Nevertheless, each person worthy of being considered wise will hold many of these qualities. Some of them might be well developed and differ from person to person while the synthesis of qualities in activities generates the synergy called wisdom. The human world should not be divided into wise and unwise people, none of them is outstandingly wise or completely unwise. Instead, a person can hold some of the characteristics, but when they are put into practice, these synthesise into wise decisions. Working skilfully, if twinned with constant self-analysis, helps humans develop greater wisdom, and in its turn, well-developed wisdom helps one to work and live more skilfully. Researchers should consider how individual wisdom meets the requirements for the functioning of the individual.

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4.3. EDUCATOR LEARNING TRANSITIONS

4.3.1. Educators as Adult Learners

The transforming forces. The key macro forces are complicated to capture, identify, and respond to by average people; the vast and deep-functioning external forces are powerful, unpredictable, and hardly controllable by single organizations in the digital age or '*age of networks*' (Ramo, 2016), and new possibilities that should be captured and responded by deep learning, understanding and competent doing that is adequate to age of network. The most general strategy is more or less clear, what is unclear is how education should move: step-by-step, respond in a hurry to everything like during the pandemic, or choose priorities and then take action. Anyway, to respond to these forces in an appropriate way university and educator knowledgeability, and most often wisdom become transforming forces.

Education has got multiple warnings about the approaching era of digitalization; among these OECD/CERI International Conference "Learning in the 21st Century: Research, Innovation and Policy" (2000); European Commission, (2002); European Parliament and the Council of the European Union, 2006). These are several among many issues and only in this millennium.

Development of digital technologies, as well as educator readiness to use them appropriately function as a transforming force. Educators themselves are regarded as central drivers of a successful digital transformation in education (OECD, 2015, p. 191), their role requires a strong digital competence.

Rethinking education and pedagogy in the digital age can be consider as one more transforming force and should become a central matter for today's policy-makers for two reasons:

> *"First, only education can form a skilled workforce that is prepared for future jobs and a changing labour market. Rethinking education in the digital age therefore constitutes a prerequisite for Europe's future global competitiveness.*
>
> *Second, only education can provide the preconditions for the social inclusion and equal participation of European citizens in a digitalised democracy. Rethinking education in the digital age therefore matters for safeguarding European values such as equality, democracy and the rule of law" (Brown et al, 2020, p I)."*

As pointed out by the OECD, the mere accessibility of devices, services and networks will not in itself make education meet the necessities of the digital age (OECD, 2015, p. 190). Teachers and educators need training that empowers them to

identify and choose the most suitable applications from a broad range of different options available for teaching and learning, and apply them in meaningful contexts.

Among the most powerful drivers of transitions in education, collaboration and partnership in social space is mentioned with educator and student learning being in the centre.

> *"It is not only based on extrapolations from trends and drivers that are shaping learning in Europe but also consists of a holistic attempt to envisage and anticipate future learning needs ... The 'learning spaces' vision puts learners at the centre of learning, but, at the same time, conceives learning as a social process. The potential of ICT-enabled learning spaces can only be realised, however, if it is embedded in a social and institutional context that is open to innovation and supported by a favourable policy environment" (Punie, 2007, 185).*

With 20 years of experience being among leaders in strategic foresight and education transformation, KnowledgeWorks among other activities is navigating the future of learning and fostering the capacity development of educators to prepare learners for success through personalized, meaningful learning. The organization has identified five drivers of change that if adopted will impact learning and teaching over the next decade:

- *Automating Choices: Artificial intelligence and algorithms are automating many aspects of our lives.*
- *Civic Superpowers: Engaged citizens and civic organizations are seeking to rebalance power.*
- *Accelerating Brains: People have increasing access to tools and insights that are reshaping our brains in intended and unintended ways.*
- *Toxic Narratives: Outdated and misaligned systems and metrics of success are contributing to chronic health issues, including rising rates of mental illness among children.*
- *Remaking Geographies: Communities are working to remake themselves in the face of deep transitions (Prince et al., 2018).*

One can come across other issues where slightly different drivers of change might be mentioned; more important is the vision of the skills that these forces challenge.

The drivers challenge new content of teaching-learning, educator-student collaboration, new virtual settings and, in general, re-shape pedagogy:

a) Michael Fullan, a worldwide authority on educational reform, the Global Leadership Director, New Pedagogies for Deep Learning (NPDL) (Fullan

et al., 2017, 24) portray the factors that transform learning, education, and pedagogy; forces that are favourable to change like exciting, passion and purpose, collective, speed of change, societal disruption; forces that 'work' against - outside the comfort zone, complex, unclear, difficult to assess, bigger system.

b) What and how to learn, what and how to teach - the two different and closely related to each other forces make a specific environment almost in each case, therefore, should be treated accordingly when constructing/designing pedagogical processes; when and with whom to learn; what sources and programs to use; how to combine formal and informal modes of learning, etc. (Beblavy, et al, 2019, 14-19).

So far, the answers to these and many other questions have been dominated by general statements, while much less attention is paid to the pedagogical provision of transitions that is essential to educator academic, research, and self-fulfilment activities.

Educators as adult learners demonstrate the most characteristic qualities added by their professional and academic knowledgeability. This symbiosis enables them to complete the pedagogical paradigm shift and interfere with the most essential changes of education in general:

- paradigm shift starts with new ideas that educators are able to generate, identify topical problems, and initiate research;
- teaching is a highly creative profession at any level of education; educators' passion is a hight that is never reached and that always challenge innovative activities;
- research and practice, the mission of facilitating learner achievements allow for spotting out the current and future needs of learners to meet the transforming forces and distil appropriate pedagogical provision.

The European Commission (EC, 2020) has identified a number of responses to the most pressing challenges that are changing all aspects of human life with increasing force. These have far-reaching implications for the future of universities, academic studies and research, which will help educators to focus their efforts in facilitating the learning and research of doctoral students. The list of responses suggests recommendations which adhere to requirements that are similar to those of higher education in the EU as a whole, help to keep pace with change, enable the exchange of experiences, and keep pace with developments across the EU countries.

Among the responses should be addressed as ways for educators to further their academic development, although, university initiatives are not limited to:

- maintaining relevance to current and future aspirations empowered by digital technologies;

- investigating the impact of digital transformation and traditional process-disruptive technologies;
- to nurture and maintain human talent to oversee the more automated research of the future; maintain an environment in which people can develop;
- coordinate plans and collaborate with work-places, combine studies and work experience, etc.

The above-mentioned responses are not new to educators. Problems arise when they are implemented in certain environmental and university cultures, where the educators' research and where further learning must line up with the forms and design of the university process. The most complicated stage of implementing the designed pedagogical process is to identify theoretical constants in real practices; the identification need makes educator activities a constantly challenging learning area.

Educators' and doctoral students' learning competencies can be organized in 4 clusters to meet the challenges of digital age and mark paradigm shift in learning:

1. Computational thinking and new media skills shift from fragmented usage of digital technology and new media sources to ability of fluent usage when translating, transforming, and transcendent processing of data by using digital tools; critical analysis and making sense of digital data and information processing to generate new knowledge, understanding, as well as forecasting the use of newly acquired knowledge in creating/designing appropriate pedagogical settings. Computational thinking as human thinking involves solving problems, designing systems, and understanding human behaviour, by drawing on the concepts fundamental to computer science (Wing, 2006). However, the more precise definition is not found yet.

Knowing The Computer Science or having well-developed digital skills but without appropriate pedagogical competence, however, will have limited possibilities in pedagogical settings. Teaching or facilitating learning is a specific activity that transforms the aims, way and assessment of how technology is being used - with the advent of digital technology, the whole pedagogical process of formal education is under pressure. The deeper the changes, the more educators have to learn, not only to keep up with changes, but to move forward by empowering students to respond to current and future challenges.

There are also other challenges for academic research stemming from the inherent characteristics of big data and artificial intelligence-based research, whilst new technologies can also change what we perceive as research. In the area of education, the debate continues around the balance between the utilitarian function of tertiary education and its role in basic research, academic/theoretical knowledge-generation, professional education, and promoting human agency. All of this, however, presupposes continuously updating the right skills and core elements, which include

adequate pedagogies, curricula, assessment modes, and quality assurance criteria (EC, 2020).

2. Deep meaning-making thinking of what is being learned, especially analysis of possible innovations that should be implemented introduce a shift from routine skills to proficiency or routine skills are considered the starting stage for further self-conducted development of proficiency and expert competence, as well as a starting stage of acquiring new skills that might be necessary by radically new devices.

One of the well-known researchers in the field of self-regulation, Barry I. Zimmerman, investigated self-regulated learning in a context of self-beliefs that "enable learners to transform their mental abilities into academic performance skills" (Zimmerman, 2008, p. 166). Self-regulating learners are active participants and demonstrate at least three types of regulation; these have been used by several researchers in constructing a valuable research methodology (Vlachopoulos & Hatzigianni, 2017, 177):

- the 'effort regulation', when a learner's self-regulation is directed to the understanding of content;
- 'interactive or social regulation', when learners self-regulate co-operation, and identify the priorities of learning in teams;
- 'metacognitive regulation', where learners reflect on their efforts.

The changes in education brought about by the power of digital technologies apply to all types of self-regulated learning by educators and doctoral students and make it a gradual process of competence development.

3. Cross-cultural learning and doing competencies introduce shifting from collaboration to international and local hybrid connectivity (online and face-to-face) with dominating partnership relations.

Educators should see the diversity of social settings, organizations, and communities as a source and driver of innovations, trans-disciplinarity, social intelligence, and adaptive thinking.

4. Pedagogical mindset in designing educational process introduces the shift from the skills of creating a content-centred process to a competent designing of the learner learning-centred process.

The researchers of DocTDL consider the learning of educators and students at the core of transition in tertiary and doctoral education from the traditional approach to that of a learner-learning-centred and participatory pedagogy adequate for the digital age. A transition that is reflected and carried out by all sub-systems of universities, especially by the academic programs and research process conducted by knowledgeable and capable educators. We focus on the learner-learning-centredness instead of learner-centredness, which is in line with The Activity Theory: humans

develop their individual qualities in activities that they take on and complete. Educators can maintain their further learning in several ways:

- educator further learning in programs or courses at institutions;
- different ways of experiential learning by doing and through connectivity in teams of educators and students; and,
- functioning in suitably improved doctoral student programs, creating programs and conducting research in teams with doctoral students.

The principles of educator further learning. Effective adult lifelong learning is demonstrated and put into practice through the learning and teaching modes, methods, designs and models that are used to address challenges by transforming digital technologies into pedagogical tools appropriate to a particular level of education.

The changing space of tertiary education, as well as the collaborative participation of educators and students in creating research-based learning environment at universities, accentuates the importance of deep knowledge and understanding of the peculiarities and principles of adult learning in the digital age, which should follow the basic principles of transition:

a) Digital technologies are adopted to the fundamentals of the individual's development through human activities, therefore, according to Activity Theory, learning can be conducted and self-directed.
b) Appropriate practices use the flexibility of the human mind, which is facilitated through learning to adopt the machine-produced part of information-processing and other changes introduced by digital tools. Education Sciences with Pedagogy, which is informed by neurosciences, make up the core of formal education are in constant development.
c) The two different activities - learning by teaching and teaching by learning are interchangeable and empower each other through transformation of university processes. The impact of the social environment on education is becoming increasingly complex, which determines the relevance of The Complexity Theory to underpin the analysis and maintenance of educational attainment.
d) Well-known multiple modes of teaching and learning provide a focus informed by the principles of learner-learning-centredness, collaboration, connectivity, and learning-by-doing. Constructivist and other approaches and theories support learner autonomy and knowledge generation. These are considered to be an appropriate theoretical basis for organised learning and practice, which they promote in the wider social and digital environment.
e) Andragogy is the theory and practice of teaching adult learners. The theory of adult education follows the same concept - not only do children or adolescents need assistance to achieve better learning outcomes. Adults also need information on recent progress in adult development, as well as

assistance to optimise learning – saving time and energy while making appropriate progress.

Malcolm Knowles (1984, as presented by Smith, M.K., 2002) provided five principles of andragogy for the design of personal computer training the content of the principles by now has been expanded especially due to the development of digital technology; nevertheless, the principles are still valid, and so we dare to recall them:

- self-concept (what I am with digital technologies, how and why I use them, etc.?),
- learner experience (what do the learners know better than I as an educator, therefore, providing role exchange?),
- readiness to learn (improve learning with digital technologies),
- orientation to learning, and
- motivation to learn.

The updated content of the principles makes them relevant for educators and doctoral students in the digital age. These are self-directed, task-oriented principles that should be supplemented by using digital technologies:

- clear reasoning and the immediate value of learning and topical problem-solving with digital technologies used in practice or for research;
- adults need to know why they learn something and accessibility of the content, thanks to digital technologies, provides opportunities to achieve greater goals;
- competence-based readiness for academic learning and research make a good background for experiential learning;
- contextualised orientation to learning and research as a possibility of new knowledge generation;
- motivation to learn related to self-evaluation, self-control, self-assessment, implementation of expectations, which due to digital technologies has become faster, more accurate and elucidates future developments.

It is only when digital technology and new ways of teaching, learning, and professional development are dynamically integrated, that technology-enhanced educator professional further development will "truly promote the growth of teachers to enhance teaching quality and efficiency" (Gu et al., 2012, 288, as quoted by Amhag et al, 2019, 2).

Doctoral students, in partnership teams with their educators, may choose to investigate the following:

- whether and how the state adult and educator education policy is implemented in the era of rapidly spreading digital technologies in education and life, its impact on the transformation of education, the further academic development and research of educators, as well as on the achievements of doctoral students;

- impact of complex drivers on educator further pedagogical improvement;
- analysis of several experiences that are considered the most effective in educator further academic development, etc.

4.3.2. On the Models for Educator Further Learning

Successful transition of the university process and closing the gaps that are common in education, not only in times of rapid change, needs addressing as these become more influential and disruptive if not attended to. There is a double purpose for the further learning of educators:

- to develop the individual qualities of educators, like competencies that are less developed and are relevant for the upcoming decades;
- to learn how to use the improved capability for their students' benefit.

The gap between educator and student digital skills in working with digital technologies, the recognised usefulness of, and motivation for, digital technologies was identified in the DocTDL project. This confirmed the acknowledged importance of pedagogical provision, on the one hand, and real usage of digital technologies in teaching-learning – on the other. The findings indicate the untapped possibilities for further development of educators in pedagogy, in designing learning with digital technologies. Educators as well as teachers tend to ask about the best possible models for updating their academic, professional, and researcher growth.

> *"A carefully designed online course should include a good balance of both synchronous and asynchronous activities with the tutor taking the role of a 'critical friend' or 'fellow learner' that allows room and scaffold learners to be able to take control of their own learning, which in turn promotes their SR (self-regulated) skills" (Vlachopoulos & Hatzigianni, 2017, 186)*

To better understand what models of further learning should be created for educators, we have to identify at least some of the most relevant transitions within the university process and doctoral studies:

1. The use of digital technologies challenges appropriately developed pedagogy of tutoring (Lakkala & Ilomäki, 2015) to provide doctoral students with a better understanding of the skills, dispositions, and knowledge in teaching-learning contexts where information and communication technologies become increasingly dominating.
2. These competencies are important when society is increasingly digitalised and new media forms are integrated into everyday life along with expanded levels of mobility. What is the optimal balance and dynamics of educators'

transversal and special skills for the transformation of the study process from the dominating impact of rivalry, which follows the Human Capital Theory-based tendencies, to changes appropriate for the Knowledge society and people's individual development?

3. The roles of educators and students, as well as their relationships, are becoming more complex and the types of online and hybrid studies are changing, therefore, universities have offered varied complementary programs (Amhag et al, 2019) whilst digital technologies are often provided with inadequate training (Koehler, Mishra, & Cain, 2013). By now it is unclear how pedagogical interventions can be developed to make learning less time-consuming to become functional in the online environment; what assistance should educators be provided with to decrease the amount of energy and time that educators spend to become functional themselves.
4. Researchers have found that a well-planned professional development program about e-learning in inquiry communities and online discussions can considerably change the educator's willingness to incorporate e-learning in their teaching. Teacher educators confess that they are never fully trained in how to use digital tools and that attitudes cannot be changed over a short period of time. Educators need to learn not only how to use digital technologies but also how to deeply integrate them into their curriculum to meet the changing needs of their students (Swennen & Bates, 2010; Amhag, Hellström, & Stigmar, 2019). They need to keep an optimal balance between systemised pedagogical knowledge, integrated subject knowledge, digital skills, and underpin all of this by an understanding of a conceptual approach to human learning and development.
5. An sense of stability can be created for educators when they are applying constantly changing digital technologies to teaching practices (Amhag, 2013; Stigmar, 2016), through an understanding of pedagogical constancies/principles and pedagogical thinking, when connectivity is recognised as a valid approach to appropriately integrate formal and informal learning in a digitalised environment and partnerships as equally valid when formed through quality relationship between educators, students, doctoral candidates and other actors in the wider environment.

The most effective models of learning for educators and doctoral students are those that are created through educator-student teams. These are even more effective if the teams continue improving the chosen/created model during its use. This constitutes learning by creating and creating or improving the model by learning. Such cooperation considerably strengthens educator, and especially doctoral student, ownership as demonstrated by the DocTDL project courses in 2019 and 2020. Participants of the course evaluated highly the possibility to create a framework for the

further learning of educators, which would improve the digital skills relevant for the implementation of doctoral programs. The materials are available at the project homepage. (https://tdl.rta.lv/mod/page/view.php?id=10).

"DigCompEdu", adopted in the EU, includes 22 educators' competencies organised by six areas. The focus is not on technical skills, rather, the educator digital competence framework aims to describe in more detail how digital technologies can be used to enhance and innovate in education and training (Redecker & Punie, 2017, last update in 2020). Training for teaching situations, therefore, needs continuous follow-ups through tuition in the different practical stages of development in the underlying ICT educational pedagogy (Lakkala & Ilomäki, 2015).

Researchers (Koehler, Mishra, & Cain, 2013) remind that there is no single digital technological solution that will address every situation of teaching and learning. It is wise to learn how pedagogical, technological, and content knowledge can interact, be integrated, and assist doctoral student understanding of the theories, practices, and problems to be investigated. Mastery level experience or learning-by-creating programs is recognised as the most important knowledge and skill in determining an individual's self-efficacy.

Researchers and doctoral students welcome the forthcoming research-based updates of educator digital competence to strengthen and continually refresh their ability to use technological tools to enable transformative learning and teaching, as well as appropriate competency descriptions that will meet with educators "… fully capable of taking advantage of technology to transform learning" (Bortwic et al, 2017, 37).

Developing a set of standards, a common set of technology competency expectations for university professors and Ph.D. candidates, is one way to judge whether faculties can meet expectations. A set of competencies has been developed, followed by the appropriate implementation by teacher training faculties, which allows educators to unite around a clear faculty development target. The fact that professional associations have endorsed the same competencies also increases the value of adopting competencies for educators. However, faculties must collaboratively and thoughtfully organise research, professional development and organisational support in order to achieve the desired level of competence of educators (Bortwic et al, 2017).

Educators and students develop evaluative dispositions as they navigate digital content: self-evaluation becomes an effective tool for making life-long learning effective, less energy- and time-consuming. Critical appraisal and accurate action using digital sources and tools will enhance the learner mindset, which enables them easily to lead the investigation rather than be led by the technology. The intellectual learning processes and critical dispositions should be integrated.

Spires and Bartlett (2012) distinguish between three intellectual processes associated with digital literacy:

- locating and consuming digital content,
- creating digital content, and
- communicating digital content.

To prepare for a career as an educator, for instance, the model by Koehler, M. J., Mishra, P., & Cain, W. (2013) holds promise, but it should not be considered as the only way. It is valuable because it synthesises technological, pedagogical, and content knowledge, in a way that liberates and provides synergy. The epitome of any model should be its specific internal synthesis of content and methods, which introduce and demonstrate relevance to learners and their cultural environment. The model consists of three interacting knowledge domains, suggests effective teaching, and requires:

- pedagogical knowledge;
- technological knowledge; and
- content knowledge.

It has been implemented with teacher educators and its relevance tested for the use of digital tools by them and against their need for digital competence in higher education (Koehler et al., 2013; Amhag, et al, 2019). The model has been developed as the basis of effective teaching with technology that requires:

- an understanding of the concepts represented;
- pedagogical techniques with technologies used in constructive ways to deliver content;
- knowledge of how technology can help to unpack concepts and some of the problems that students face;
- the prior knowledge of students, especially concerning its methods, validity, scope, beliefs, and opinions;
- knowledge of how technologies can be used for fostering knowledge and developing new epistemologies or strengthening the old ones.

Researchers (Collar & Colin, 2021) report that the dominating models with competence development at its core have not reached the desired goal because knowledge is conceived as a synonym to learning content. They suggest a Model consisting of seven groups of competencies to be developed in the teaching staff initially and to refine permanently: logical thinking, verbal reasoning, scientific culture, critical and propositional reading-writing, global culture and environment, metacognitive and creative thinking to investigate, innovate and undertaking; and finally, vocational guidance and talent orientation.

The suggested Model conceives “competencies” as an alliance of essential disciplinary concepts, skills, and attitudes, acting integrally and optimally to face life’s challenges. It supposes conceptual foundation strengthening and improving didactic

methodology according to curricular contents (including digital tools to teach and evaluate learning). It also implies reflective practice: knowledge construction process, pedagogical foundations, learning management, and orientation processes from the point of view of integral educational counselling (healthy habits, values, civic, art, literature, sustainability, personal development, etcetera).

The educators report that their academic and professional competence merge and involve more than just knowledge. Skills, attitudes, and motivational variables also contribute to the competence of teaching and learning; models should identify and foster cognitive abilities and affective-motivational characteristics as the two main components of educator's professional competence (reflections on the courses run by DocTDL):

- cognitive abilities (professional knowledge, general pedagogical knowledge, content knowledge, general pedagogical content knowledge (didactics);
- motivational components (self-regulation, motives of teaching, professional beliefs).

Educators and doctoral students being adult learners prefer learning and consider it more effective if conducted collaboratively, especially in mastering the digital tools of teaching-learning. A possible synthesis of the above components could be a source of a hypotheses investigating the development of educators, either through assisted or self-directed learning and also doctoral student competence / capability, by implementing a course for the further learning of educators or a doctoral study program involving teamwork with doctoral students. There were some pointers collected during the DocTDL project courses of what to take into consideration when creating a model to improve educator academic-pedagogical competence in a self-directed or team-based mode:

- Pedagogical competence stands for the educators' academic knowledge, skills, and attitudes, more precisely – for the educators' pedagogical capability, especially for their implementation in education (delivering courses and tutoring) and research practice.
- The content knowledge to be transformed through modes of further learning, is integrated with knowledge and skills in digital technologies and transformed into pedagogical knowledgeability and capability.
- The pedagogical competence/capability improves when it enhances doctoral students' understanding of the course of study, as a basis for underpinning the research, as well as for beginning the potential investigations.

The educator's digital competence and/or computer self-efficacy are manifested in three levels of digital skills' mastery level attributes (modified for educators from Compeau & Higgens, 1995). Doctoral students and educators can use other approaches to the competence criteria and identify updated attribute levels; the suggested ones can

help to plan, conduct and evaluate learning:

- strength – the ability to provide mastery level pedagogical experiences in the use of digital technologies in order to enhance doctoral student inquiry-based learning and conduct doctoral research through performance of the educator's pedagogical competence;
- magnitude –quality reflection by the educator and self-assessment of their cognitive processes – perception, interpretation of ideas and theories, knowledge-generation, concept-generation, analyses of the content knowledge and transformation into learnable content for students; the ability to manage information and communicate, etc.;
- generalizability - demonstrates the degree of technical knowledge to connect different technologies with an educational purpose; knowledge, and choice of technologies that are best suited for addressing the learners' need and the particularities of the subject-matter.

Doctoral students and educators can choose for their research, problems related to the implementation of their most effective experiences, as well as EU initiatives to update the listed digital skills of educators:

- Is the transition from The Human Capital Theory, which focusses on competition and economics, monitored by the government in order to help the university process focus on the individual capability development of educators and students appropriate for a Knowledge Society?
- How the digital skills and advice suggested by EU, OECD, UNESCO are implemented in universities, are they appropriate models that provide a picture of the study programs for the education and research of doctoral students, which have been worked out and implemented accordingly; are the programs or models effective?

The theme of models is not exhausted here, these are only some cases that might trigger deeper and higher-order thinking of doctoral students and enable them to create new relevant research ideas.

4.3.3. Accent Shifts in the Educator Further Professional Development

Educator pedagogical further development is a new area of research. It was a couple of decades before when it became evident that educators' further professional development was indeed a relatively neglected area. The ice was broken by the initiatives of the International Professional Development Association (IPDA) that focussed part of its activities on educator further development, especially through conferences and the journal "*Professional Development in Education*". In 2008 the experience of different countries was published in a collection of articles (Swennen & van der Klink, 2008).

The 2020 online conference discussed identity, ethics, and the ability to respond beyond professional standards. The central idea of the conference has been defined as a challenge of the current global processes that create economic and social inequalities, austerity, forced migration, climate emergency, conflicting values in multicultural societies, and discourses of 'post-truth' that mistrust 'expertise'.

The conclusion that educator profession require standards is triggered by often an inadequate preparation for practitioners to work effectively in front line contexts (IPDA, 2020) caught the researchers' attention. Discussions triggered problems, new discussions, as well as new problems for research – why does this gap or discrepancy exist?

Following on from the EU, OECD, and UNESCO issues that accentuated the importance of the development of skills and competencies, The Millennium Development Goals were agreed upon by representatives of 189 countries and based on the Millennium Declaration of the United Nations (2000), which was planned for completion by 2015 and marked this year as a certain turning-point in education. Among the goals, the Global Partnership for Development was nominated – a relevant brief for educators, researchers, doctoral students and those awarded the Ph.D. degree; goals were initiated to radically improve the social environment (https://www.who.int/news-room/fact-sheets/detail/millennium-development-goals-(mdgs); as well as the impact and validity of digital technologies (Beblavy, et al., 2019).

The 21st Century competencies in the centre. Quite a lot of publications discuss the 21st-century competencies without a deep analysis of the role of basic learning skills and digital learning skills. These should be contextualised with a systemic education (Kuh, 2019). The popular International Yearbook of Adult Education (Sheemann, 2019) concludes that basic competencies like reading and writing skills (at the relevant level) are seen as the necessary fundamentals, not only for the digital competence enhancement of children or adults, but also for independent and far-reaching social participation.

The proportion of adults who only have low reading and writing skills is declining and differs from country to country, nevertheless, even in well-developing countries there are large proportions of adults who perform at a low level in literacy assessments (Grotlüschen, 2019, 17-34). “Low” not only incorporates the meaning of poor reading or writing, like being illiterate, but also the fact that basic learning skills may be underdeveloped if they are linked to the level of education and the requirements for the pertinent competences relevant to the job. Closing this gap is a precondition of closing the theory-practice, research-implementation, or knowing-doing gap in the further learning of educators, doctoral studies, and research conducted by universities.

Researchers (Ungar & Baruch, 2016) claim that, for example, educators have a

fundamental role in teacher education at least in two ways:

- direct teaching about the profession and serving as role models for information-based teaching, and
- communication-based teaching with digital technology.

It is important to know, that the experience of educators in the institutionalised education process could be described as the establishment of expert associations for international comparative research in adult education. The advent of digital technologies and the speed at which these have been introduced during Covid-19 call for investigation at all levels of education systems. A lot has been done through research projects, especially by the national program with 10 projects to mitigate the impact (https://www.izm.gov.lv/lv/jaunums/valsts-petijumu-programma-covid-19-seku-mazinasanai-tiks-istenoti-10-projekti). Much still should be done to help educators and doctoral students develop their digital competencies and catch up with the digital developments and cooperation between formal education and the wider environment.

The transformation of education at the doctoral level should be considered a good schooling process, or a model, for educators' competence development. Appropriate process-oriented competence for designing and conducting the transformation process is particularly relevant in education and pedagogy (Koller & Radtke, 2019, 65). In doctoral studies this should be a process of inquiry-based and inquiry-oriented education that is created in partnership among doctoral students and their scientific advisors.

For any doctoral research of educator pedagogical competence, it is important to point out, that the earlier OECD measurements, based on human capital economics have been changed to those with human needs at the centre. The OECD strategy had moved beyond the proxy measures, which were no longer sufficient in the context of lifelong learning, the knowledge economy, and appropriate competences. This is evidence of how the developments in digital technologies should be followed by shifts in education and educator lifelong digital learning.

In addition to this observation, the focus on achievements and participation produces a certain imbalance, when adult education systems are evaluated only by a narrow and partial definition of their outcomes; transitions have to be perceived as a complex and integrated issue.

When shaping teaching and learning for the 2016–2017 school year, the International Society for Technology in Education (ISTE) got feedback from more than 2,000 educators and administrators and used these data to redesign the standards around seven themes: Learner, Leader, Citizen, Collaborator, Designer, Facilitator, and Analyst. These 2017 ISTE Standards for Educators (https://www.iste.org/standards/iste-standards-for-teachers) incorporate many of the previous standards, as well as added a focus on collaboration, digital and media literacy, computational thinking,

privacy, student empowerment, data-based decision making, and cooperated teaching colleagues.

The ISTE Standards for Educators set a vision of how educators can use technology to create next-generation learning environments in higher education by a transition from using technology to delivering content to using technology to empower learners as valued professionals within their organisations and communities who are enabling students' learning-centred studies and practice at the highest levels.

Digital technologies, in contrast to many traditional pedagogical technologies, have a wider area of operation: these may be used in different ways in unstable and rapidly changing environments, in areas where restrictions exist, such as the lack of theoretical and pedagogical keystones, sustainable integration of formal and informal educational contexts, and, particularly, the lack of teacher support (Baran, 2014). It is the researcher's task to note these cases and that this might be a problem for investigation that could be the basis for working out adequate models of educator and doctoral student competence development.

When transforming the pedagogy of higher education, digital technologies may be considered more than a traditional tool, becoming instead part of the 'how' and 'why' of educator and student actions, as well as 'what' they do and even 'what they are'.

To develop this vision further, doctoral student participation is needed, especially in teams with educators, focussed on partnership, enterprise and student-direction. This should be advanced through learning, which has inquiry and problem-solving at its core and which embraces computational and educator professional-pedagogical thinking. A vast field of doctoral research opens up here:

- to what extent do widely used digital technologies develop partnerships in student-educator team research, trigger and maintain the transformation of the role of educators and learners and make them interchangeable?
- what is an optimal balance between modes of formal and informal further learning of educators, whether and how the balance is maintained due to the wider possibilities of digital technology compared to traditional pedagogical strategies; what is the optimal integration between the use of digital technologies and traditional pedagogical strategies?
- the stages of educator further learning with digital technology; stages of transformation of the tertiary and / or doctoral process and what core characteristics should be attained at each stage;
- does use of digital technologies close the gap between educators' narrow pedagogy, mainly dominated by knowledge of the course, on the one hand, and integrated pedagogical, technological, and content competence – on the other?

The Case Studies (Section 3) illustrate the peculiarities of digital transitions just as a way of generating new ideas and also illustrating the different experiences, even when the goal is the same. For example, the investigation conducted by professor V. Ļubkina and her doctoral student O. Vindača demonstrates a gap between educator digital skills and their desire to improve these skills – a promising and motivating source for educators seeking topical issues related to further learning and converting knowledge into knowledgeability and professional wisdom. Dr. Mykhailenko-Blayone shares her experience of conducting fully online classes. Olena Hrebeshkova suggests for discussion the transformational challenges of e-learning at Kyiv National University of Economics, Ukraine. Experience of EILAB (Ontario University) is also presented there.

In Latvia, doctoral students' and educators' digital pedagogical competence still needs to be better integrated into the doctoral programs of the universities, including those designed for pedagogical purposes. Doctoral students' competencies, as a target of the doctoral program, have been worked out recently based on the analysis of the most successful programs in other universities, especially those of the EU and compared to several other regions, like Australia, UK, and the USA (Žogla & 'Lubkina, 2020). Nevertheless, the program is yet to be tested through practice, therefore, the analysis of its implementation, as well as the competence of the scientific advisors', remain topical and open a vast field for possible doctoral research.

Accent on how we use what we know. The EP Think Tank (2020) analysis focuses on six challenging items that tertiary education in the EU is facing:

- the need to maintain relevance for current and future aspirations,
- the impact of digital and disruptive technologies,
- the way it collaborates with business,
- global and intra-EU collaboration,
- quality assurance, and
- financing and barriers to inclusion.

The list of the desired features and challenging items is not new to educators. The most pressing question is how to transform education in universities and enable educators to practice partnership pedagogy in academic studies and research that integrates these current issues.

Charles Fadel, a global education thought leader, expert, and chair of the education committee for the Business and Industry Advisory Committee to the OECD reminds us that:

> *"Our skills are how we use what we know, helping students develop and strengthen their skills is absolutely necessary if we want the education outcomes that serve students well today and in the future."* (*Fadel, 2016, 22-24).*

The author indicates six of the most essential qualities for success in learning: mindfulness, curiosity, courage, resilience, ethics, and leadership; all other characteristics and concepts fit within these.

As an example of transformational pedagogy in doctoral studies, the project DocTDL (2018 – 2020) investigated educators' and doctoral students' digital skills and attitudes to digital tools. From the theoretical analysis, empirical investigation, and observation of the examples of computational and pedagogical thinking in the doctoral program in education and courses for educators, it can be argued that we can now teach, learn, and live with digital technology and within it (especially due to the rapid transition to the online mode of studies caused by Covid-19). The experience thus acquired adds to the digital competence of educators, and the dynamics of this competence is waiting to be researched and described.

Among the key questions is how educators have transformed their academic activities and research, whether and how their attitudes have changed to digital technologies since the immediate transition to fully online classes caused by the pandemic, when there was no time to consider choice or suitability. What transformations did their prior knowledge, skills or competencies and educator-student relationships experience? The list of similar questions could be much longer. "Consider the dynamism of education today. Education is now a 'commodity' that is much in demand" (Ko & Rossen, 2017, 422). There is no one to tell us how and when this world is going to change, only a few general predictions are possible.

Analysis of the most popular student skills development projects (ATS21, EnGauge, The United Kingdom model) led to the conclusion that the most appropriate theoretical approach for doctoral studies, as well as for educator further pedagogical development will be the inquiry-based and inquiry-oriented process, which integrates doctoral academic studies and research (Mieg, 2017). The online mode of formal higher and doctoral education is becoming dominant and central to the meaning of learning, becoming knowledgeable, and achieving wisdom in digitalised practice. Moreover, inquiry learning integrates the doctoral students' academic studies and research, as well as research skills with the researcher's individual qualities (Willison & O'Regan, 2008, 2015). This characteristic of the doctoral process calls for investigation of appropriate educator skills and competence.

The project group has published the theoretical surveys (see the project publications and table of researcher skills' dynamics in Žogla & Ļubkina, 2020, 47-52) to profile the knowledge base of educators and doctoral students of the doctoral program 'Education Sciences' as well as the researchers' inquiry-based skills' dynamics. The publications are designed to serve as a background to the key questions addressed by the study. The phases or levels of inquiry skills demonstrate step-by-step development and can be used for skill self-assessment and evaluation.

Scientific advisors of doctoral research are considered experts, knowledgeable in conducting research and providing their doctoral students wise pedagogical assistance, which is of particular importance in the changing educational arena. Nevertheless, they expressed their willingness to discuss advisor competence in the context of multilateral education transition. As professionals in their field of sciences, educators can be expected to acquire, process, and evaluate new knowledge relevant to their core research practice, as well as update their knowledge base to improve their research and to meet the new demands of doctoral studies. The project researchers suggest practising discussions, sharing experiences, and at least mini-investigations to create new knowledge and appropriate skills. The courses initiated by the DocTDL project have affirmed this form of further pedagogical development of educators.

Towards assessment-embedded paradigm. The policy of the European Union for teaching-learning in the 21st century defines competencies/skills in documents and materials on DigCompEdu (The European Commission, 2017; Redecker, 2018) that suggest activities like problem-solving, critical thinking, collaboration, communication, which might help upgrade the educators' knowledge-base and entail a re-skilling.

Alongside this, the project also realised the contemporary shift in the educational process moving assessment to the forefront and having reflection and self-assessment throughout the whole process of teaching-learning and education in general. This conclusion is in line with much wider investigations (Redecker et al., 2013) that call this transformation of the process as moving from the 'Explicit Testing Paradigm' to the 'Embedded Assessment Paradigm'. The latter means a radical transformation of a university process, which can be effectively completed through an ownership-based approach between teachers and students. Educators and doctoral students first have to understand what an Imbedded Assessment Paradigm is and how this should be implemented.

The starting point can be deemed the critical analysis of B. Bloom's taxonomy, that has moved evaluation to the top of the well-known pyramid, and by doing so has triggered transformation of the whole pedagogical process. A conceptual framework, with a secondary school orientation, has been worked out by the Gordon's Commission in the USA (2012). It is now time to investigate a pedagogical shift in the university process where educators and students live with and within digital technologies – a research area for educators and doctoral students.

Educator researcher capability to empower researcher skills of doctoral students. Educators know that first-year doctoral students' research experience is limited, and they often ignore or their prior knowledge limits the determination of deep relationships or connectivity among data and findings when analysing the collected data. Knowledge of pedagogical content influences student achievements more than knowledge of content about a subject, because the educator's help is always

deliberately focussed on the students' abilities and achievements. The higher general pedagogical knowledge of the educator provides for deeper and more innovative doctoral investigations. Therefore, it would be useful to identify and describe the dynamics of the scientific advisor's pedagogical skills or competences empowered by digital technologies.

Despite the research that has already been completed, it is necessary still to define and describe a cross-cultural conceptualisation of general pedagogical knowledge and educator skills that might serve as a basis for re-thinking pedagogy. On the basis of theoretical and empirical analysis the DocTDL project defines several areas and transformations of educator academic and professional enhancement that are worthy of further investigation now in the context of digital technologies. These are:

- moving beyond professional and researcher standards or using the standards as a guide to cultivate educator wisdom and pedagogical philosophy that stems from the integrated competence of a leader, designer, learner, facilitator, and analyst;
- prioritising self-, peer-, and educator assessment through the whole educational process on the basis of the wide use of digital technologies that make this process broader and deeper, along with saving time and energy;
- conducting inquiry-oriented and inquiry-based studies and developing the capability of conducting timely research through partnerships, by practising online discussions, sharing of experience, and using the expert knowledge of peers;
- working in partnership in teams or communities of colleagues and doctoral students promoting high-quality critical thinking, inquiry practice, and responsibility in implementation through practice;
- the most effective doctoral investigations are those that are completed in line with the transition of the university or the work-place of the doctoral student, instead of simple perceived improvements - during the total digitalisation 'patchwork' approach to doctoral research, as well as to educator further learning, which is less effective.

Another key driver for the educators' participation in research is the importance of continuous learning and the desire of educators to reflect on and improve learning and teaching based around the following key phenomena: the dynamic character of knowledge, digitalization, societal change and changing educational landscape, inter-professional working, connectivity, and collaboration.

There are several reasons for having knowledgeable and competent educators who are aware of the dynamic phenomena mentioned above:

a) the content of education at all levels is changing and digital technologies open free access to publications;

b) pedagogy of tertiary teaching is developing due to the growing role interchangeability and partnership in research and learning that stretches far outside the universities;
c) digital technologies make the whole university process change; identification of this phenomenon for each component of the process is a valuable precondition of successful transition.

At universities, usually certain staff members are identified as being "research active", others do mainly the academic work. This means that some have a teaching and research role whereas others are limited to a teaching role, much of which involves practical classes and should involve research-based studies. This is not a satisfactory decision since, arguably all staff in higher education should be engaged in both teaching and research, supporting inquiry-based tertiary learning and integrating academic studies with research.

Tertiary teaching and doctoral studies are now being increasingly student learning-oriented and have turned into a process in which cooperation, partnership, and communication with students, among students, and among colleagues are crucial. Self-initiated and self-regulated learning of educators and students, their cooperation and partnership relations are now more important than the receptive process of being taught. Investigation and description of this turning point will be a useful contribution of researchers.

In the last two decades when competence approach dominates in higher education and educator further professional development the area of education and its environment has changed. Unfortunately, it has not reached the desired quality yet.

4.3.4. Re-thinking of Pedagogy or its New Message

Partnership for the shift 'from survive to thrive'. According to Deloitte's 2019 Human Capital Trends (https://www2.deloitte.com), 86% of organizations recognize changes in the way people learn at work. Yet, only 46% of people in these companies felt that they were ready to take on the challenge. Certainly, these figures will vary from year to year, nevertheless, with the right mindset and digital tools, the learning and development programs can be effective in a virtual environment. Making the shift from "survive to thrive" is dependent on an organisation becoming distinctly human at its core—a different way of being that implements human angle first by every issue, every decision, and every activity. University mission is already among the most human ones but education of specialists who are able to implement the 'human angle' is still waiting for improvements or even paradigm shift.

The ‘Deloitte’s 2021 Global Human Capital Trends’ research points out:

> *“... those who adopted a thrive mindset were three times more likely than their peers to bring human strengths to the fore-leveraging worker adaptability and mobility to navigate disruption” (Volini et al., 2021).*

While 2020 activities were focused mainly on survival in the pandemic conditions, educators and universities are now facing the challenge of thriving among the unprecedented disruption. COVID-19 proved that teachers, educators, and universities are capable of tremendous changes and growth under the pressure of crisis; these now are working to thrive and sustain in the long term not to have lost the achievements that required high returns and even burnout.

The investigation and enhancement of educator pedagogical knowledge and pedagogical thinking, understanding of approaches, modes, and models of learning and assisting /facilitating students' activities is a worthwhile achievement. Most studies distinguish between the declarative ('knowing that') and procedural knowledge ('knowing how'), distinguish these from cognitive psychology as a theoretical basis because pedagogical knowledge is a synthesis of several sciences that are synthesised in an educator's professional philosophy or philosophy-in-use. By doing so, organizations prioritize knowing how.

The past few decades of pedagogical thinking have maintained an unchallenged drive to more active forms of student learning – collaborative, experiential, inquiry-based, problem-based approaches following theories of constructionism and situated learning. However, there is nothing particularly new for educators to consider as digital technologies enter the field of education. Papyrus and paper, chalk and print, overhead projectors, television, even the basic technologies of writing and e-reading were innovations once. None of these technologies has indeed changed human beings' fundamental capacities to learn, if learning is understood in purely cognitivist terms. But they have profoundly changed how ideas and practices are communicated, and what it means to be a knowledgeable or capable person (Beetham & Sharp, 2013). Changes do interfere with relationships, values, and attitudes. Even more: the learners’ individual moral and aesthetic qualities, such as responsibility, are advanced as central.

The investigation of the latest decade suggests that the educators’ pedagogical knowledge should prioritise individual development and enhancement of a person’s characteristics, which are necessary for life in a multicultural and viable society. This component of formal and informal education becomes dominant and usually manifests itself through attitudes. Several authors (Beetham & Sharpe, 2013; Laurillard, 2012; 2013) return once again to the question of nature, role, and need to re-think pedagogy in the digital age, and whether technological innovation implies the renewal of what educators and researchers mean by the pedagogy of university education.

Despite the considerable social changes and development of digital technologies, as well as statements from opinion-formers about the technological revolution and crucial changes to what students will learn in the 21st century, which challenge the research-based fundamentals in the lists of skills published by the OECD and EU, the fundamentals of human individual development do not demonstrate considerable changes.

Fundamentals allow for innovation. Neurosciences provide deeper and wider knowledge of human mental development but the theoretical concepts and approaches still address the classical basis of pedagogy and authorities like J. Dewey, L. Vygotsky, and J. Bruner. The challenge to educators' fundamental understanding of what it takes to learn in formal education settings of the 21st century is still slight. Pedagogy is seen as guiding the learner to learn and leading the use of technology, rather than adapting to life with what technology offers. The latter is a topical area for research, preferably by learning through inquiry.

Pedagogy, being closely related to digital technologies, changes its scope and strategies under the influence of multiple learning possibilities. These trigger a different kind of relationship between the educator, the students, and the content of learning; all of this calls for rethinking pedagogy in favour of learner self-directed learning.

There is no doubt that a specific fundamental pedagogical relationship does exist in processes where one is learning and the other is assisting or enhancing (coaching, facilitating, etc.) learning by using a chosen content. When rethinking pedagogy for an age of digital information and communication, educators re-articulate the entire discipline of pedagogy in this new context – rearticulate university teaching-learning, which is being changed considerably by personal web pages, blogs, podcasts, etc. that are democratising the creation of information. The powerful processing of information by students makes the educators' assistance change, become more elaborated, smart, or optimal.

The focus has been shifted in recent years from individual author designed modules to team-based design of the whole program/curriculum or courses, and student participation becomes essential. The students' digital skills and access to digital tools have initiated remodelling of education, so that students can take growing control of their own learning, while the educators' role is to introduce studies and research, assist students to better their achievements, and function as experts, comparing the students' achievements with the aims of the programs or standards.

It has been proved by practices that designed with students' participation programs strengthen students' ownership. Also, it is well-known that programs do not change every year. Therefore, discussion of the mission of the program, the purpose and potential of helping students is needed to strengthen learner ownership be the learners school pupils or university educators. The paradox of current practice is that

learners usually have to study an unfamiliar program about which they have little knowledge.

In fact, the essential dialogue between the two activities – learning and teaching - is at the heart of what we mean by 'pedagogy', and helps us to reclaim the idea of teaching from the negative associations with domineering, unresponsive, or even repressive forms of instruction to the pedagogy of assisting and facilitating learning and the enhancement of individual learners' abilities. Pedagogy, then, involves ways of knowing as well as ways of doing.

Like other applied disciplines, it is centrally concerned with how we understand practice (the 'evidence base' for theory), and how we apply that theoretical understanding to practice once again. Rethinking pedagogy in relation to new digital technologies is particularly urgent, as educators who are passionate about these technologies are often accused of using them, whether they are pedagogically effective, follow the logic of computer science and not even knowing the long tradition of pedagogical evidence and thought. (Beetham & Sharp, 2013).

The shift in emphasis in the university process interferes with the organisational support of the process, as well as with the knowledge and skills of educators organising studies and undertaking research in the digital environment. For instance, self-assessment of prior knowledge and skills, assisted in the process by educators, is needed to achieve the aims. The aims of the process focus on the learners' achievements, with assistance from educators, Tools are mainly suggested by educators (for learners), seldom selected by learners (for themselves in self-conducted learning) and following advice from educators. The process of learning or research should be self-directed with educators suggesting some sounder solutions for debate while the final self-assessment should be compared with the educators' assessment to indicate how the standards or program goals are being achieved.

When educators consider a design, or an organisational setting, for learning, they see it as intentional and systematic, as well as possibly a creative environment for learner interaction when working with the requirements of the subject matter and task. In reality, learners and learning situations are unpredictable, especially around digital transformative learning. Educators encourage learners to engage in dialogue with each other, respond individually to learning opportunities, and to take increasing responsibility for their own learning. That is why educators' activities are often compared to orchestration or based on wisdom.

Teaching 'hides behind' generic and transversal skills. This is another aspect to consider. Educators and students have a particular concern: both join the Zoom, Team, or another relevant platform for a current class, which is well prepared, though the emphasis has changed compared to traditional settings. The e-process is not so much about getting new information, it is to get answers to the questions that arose in preparing for the discussion, systemising, generating concepts, and a new hypothesis.

This is another design of university studies, which are based on the relevant competencies of educators who practise another pedagogy, now called learning-oriented partnership pedagogy.

Traditional lectures almost disappear from the university setting; there is nothing to do if learners are not prepared for the class – 'empty' heads do not discuss, do not generate concepts, etc. Informative component of the classes has almost disappeared and learning partners' discussion has stepped instead.

Some advice for doctoral research: investigating the knowledge of educators as 'research and learning specialists' involves understanding of what this knowledge is and how it functions in online teaching-learning and makes it a unique process, how educators apply their knowledge when commenting on students' discussion, and make decisions or draw conclusions.

Actually, it is important to trace how educators initiate team-work, suggest alternatives to increase student understanding and change the process design, because even those students who feel involved and are effective participants, disengage from discussions from time to time and stop participating, at least for a while. The peculiarity of e-process is that educator will not see all participants at a time, or the pictures are so small that it is difficult to capture the learners' mood, etc. The pedagogical process stops, and the activities of educators need to respond to the changed perceptions and reactions of learners – a poorly investigated aspect of e-learning.

Bits of evidence put forward by researchers indicate that generic skills develop together with certain kinds of pedagogical approaches and strategies, such as group activities, participation in discussions, and projects (e.g., Ballantine & McCourt Larres 2007; Kember 2009; Smith & Bath 2006). Recent studies from different fields allow us to predict the growing role of generic skills in the working world of the future (e.g., Forbes 2013; Future Work Skills 2020; EC, 2010; Virtanen & Tynjälä, 2018). The required generic skills, which workers will need as occupational requirements, will be as important as the field-specific ones. These will include social, organising, learning, problem-solving skills, etc. Integration of these skills in digitalised environments, as yet, remains less investigated (Tynjälä et al. 2006; Virtanen, Tynjälä, and Collin, 2009). Virtanen, A. & Tynjälä, P. (2018) distinguish between four basic elements of building generic skills:

- theoretical, conceptual knowledge;
- practical, experiential knowledge;
- self-regulative knowledge, and;
- sociocultural knowledge.

"Pedagogical practices nurturing the learning of generic skills in higher education: the graduates found that situations that demanded

collaboration, participation, involvement, and interaction allowed them to most develop their generic skills" (Virtanen & Tynjälä, 2018, 881-2).

During their practicum students with well-developed generic skills were successful in teaching for understanding, used a variety of assessment methods that required the deployment of the desired capabilities, and collaboration. Students demonstrated features of teaching that are directly related to the characteristics of a constructivist learning environment (Virtanen & Tynjälä, 2018, 881-2).

On one hand, efficient learning takes place in 'real-life' contexts, on the other - learners have to achieve much in a comparatively short time to 'catch up' with the development of technology, boosting the amount of knowledge, and extending the possibilities. All of this means that during certain periods of a person's life or for some specific purpose, such as doctoral studies, students need the help of more knowledgeable specialists in order to optimise their learning. Then it becomes difficult to identify the intended and unintended learning in the contrived situations that happen face-to-face or in online formal studies.

Learning how 'to do' a learning activity that is set out in the programs, standards, or by educators may be a major part of what university suggests; thus, the students have to choose or agree with it. Moreover, the educator has little, if any, control over the self-directed learning of doctoral students, but such unintended learning often is initiated by the intended one or the university program.

The is little or no evidence to confirm the hypothesis that digital literacy alone leads to fundamental cognitive changes or higher modes of intellectual functioning. Considerable changes in cognitive ability are accentuated by the cultural context, as well as learners' activities in the social and natural environment, leading to transfer of skills associated with literacy to other non-intellectual activities.

For instance, young people show high computational ability in the meaningful context of their out-of-university life and educators do the same, because the situation is of their own choosing. Nevertheless, students, as well as educators, demonstrate lower ability in reproducing these skills to the same extent in university classes, even the online ones because in the formal educational process, learning is enhanced by educator pedagogical abilities.

Unintended practice puts to better use those digital skills that are acquired during free-choice, real life situations, while intended practice usually demands slightly, or even considerably, relevant new skills or tools to use in new situations.

Moving to an online process during the pandemic became a must. This led to brushing up, considerably, teacher and educator digital skills, as a part of a real-life situation. The help of teachers and educators ensured the required changes in learners, to meet the needs of the situation, but the help, as such, has not been withdrawn. Moreover, it has been changed or modified to meet the needs of the learners in the new

situation. This is a clear extension of formal education to pedagogy, providing the necessary assistance to close the gap between intended and unintended learning.

Closing the gap in an efficient way between the learner's experience and yet unknown, or not acquired, skill is a constant objective of pedagogy or formal models of education. The general mission of pedagogy is to empower learners for being able to learn, to do, to be, develop capability, and enhance other individual qualities for life in its wide sense, now in disrupted environments.

> *"The sciences of pedagogy are moving the education profession away from a concern for the transfer of the capacity to appreciate and understand the knowledge and to utilize skills, toward concern for the involvement of learners in the creation of their own knowledge and understanding" (Gordon Commission, 2011, 1(1), p.3).*

Educators, as well as school teachers, face the dilemma of how to transform the traditionally used modes of teaching-learning into those adequate for the smart pedagogy of the digital age and chose to prioritise learner participation, which is supported through participation and modest involvement.

In the 1980s the phrase 'optimisation of pedagogical assistance' became popular. This included achieving as much as was possible in the real situation by rational use of teachers' and learners' physical, intellectual, and emotional energy in the allocated time unit (Бабанский,1982). Actually, it is the central variable, an internal balance of a pedagogical process that changes its content, methods, and organisational forms according to age, student abilities, the environment, and the educator's professionalism.

Collaboration and partnership. The G20 countries have pointed out the urgency of transforming traditional teaching and learning practices in order to prepare students with quality comprehensive skills. To achieve this, countries are asked to collaborate without delay and to develop a breakthrough set of measures to track appropriate pedagogical transformation (Istance, Mackay, & Winthrop, 2019, 28-32). Four questions have been defined that comprise the most urgent transformations in pedagogy. These, when coupled with the challenges of the pandemic, suggest the essential issues for the doctoral research in the digital era:

1. How the data obtained by the standing international projects (like TIMSS, PISA) are being analysed and/if pedagogical constancies are being traced?
2. Whether and how digital technologies are used to achieve the right pace of change, reflect and initiate transformation to address key gaps?
3. The most salient national measures to track whether pedagogical transformations are productive and the direction of the shift is appropriate.

4. Recommended a research-based approach to collect, analyse, report and share the data and the activities, which ensure that appropriate transitions or advances are provided, as well as a better way to serve the effectiveness of the university process.

Among the new measures a widespread and considered use of digital technology, as a part of pedagogy, should be evaluated for its impact on the following:

- The extent to which educators and doctoral students are collaborating and communicating; how collaborative research teams are crafted to provide the doctoral students appropriate academic and research opportunities; practices for sharing and processing the data; discussions of the outcomes and their innovative application to improve the field of education and/or the most decisive components; as well as analysis, to what extent is the process of institutionalised teaching-learning empowered by informal modes of learning, and the appropriate balance between formal and informal modes of learning.
- Whether teaching-learning is taking place in a wide range of contexts and relevant social activities; whether the doctoral research is empowered by technologies investigating and integrating local and world-wide processes; whether the doctoral students' knowledge and skills are adequate to identify and tackle current problems so as to close the gaps in a rapidly changing world.
- Effective practices of self-assessment and evaluation of doctoral students' performance, which captures their abilities across academic knowledge, research and pedagogical skills development appropriate for 21st century competencies.

Deep analysis is important of the effectiveness of local and international partnerships between scholars and researchers, institutions and enterprises, etc. directly impact education transitions, and creation of a policy environment conducive to adapting rapidly and meeting the demands of the future.

The new sounds of the old message. Pedagogy as an Education Science, practice, and university discipline has developed its theories and multiple practices of education in a complex epistemological model with two structural directions (Santoianni, 2017):

- The pluralism of pedagogy is represented by its possible theoretical paths, historical and philosophical dimensions, by the different levels of sharing between disciplines and by a multiplicity of aspects.
- The dialectic background of pedagogy conveys its contradictory nature divided between science and philosophy, science and art. The systematisation of educational sciences strengthens the philosophical role of pedagogy. The so-called identity crisis of pedagogy will cause it to rediscover the sense of its own reflexive intentionality. The relationship

between theory and practice makes pedagogy a science of education, in particular a theory of the educational development processes.

A well-known researcher Diana Laurillard, Professor of Learning with Digital Technologies (UCL Knowledge Lab, UK) provides a response to the questions: "Do we need to re-think pedagogy and its specific message again and does technological innovation imply the continual renewal of what we mean by pedagogy?", which is clearly in favour of pedagogy that is seen as guiding learner to learn and use digital technology rather than adapt to what technology offers (Laurillard et al., 2018).

Digital technologies interfere with learning at any stage of education; this invites educator to keep in mind that pedagogy is about guiding learning, rather than leaving learners to waste time finding their own way, even if they have well-developed digital skills. Digital technologies have changed education and pedagogy, but our understanding of how students learn, does not require change. It is based on the psychological fundamentals that remain without change, in spite of the number of publications on how students will learn in the 21st century. Neurosciences provide an opportunity to hold much deeper knowledge of how learning happens. In addition, digital technology was neither designed nor developed rapidly with the prior educational aim in mind, therefore, it is necessary to adopt technologies for effective use in pedagogy and even self-education.

To make this clear, for instance, a learner's achievement does depend on his/her reading and listening skills, these are only preconditions to learning, even if modern digital technologies are used. This will be one of the most profound mistakes of pedagogy, if the understanding of learning is limited to frames of acquisition or reduced to memorising and accumulation of information in one's memory.

To escape pedagogical errors, we have to distinguish between learning as a category of psychology that describes the mechanisms of human learning or the functioning of the human psyche, and as a pedagogical category that describes the kinds of pedagogical assistance, a sequence of activities to help learners to learn, as well as learning through inquiry or research. These coincide with the type of organisational situations in institutional education like partnership, cooperation, discussion, experiential learning where The Activity Theory can be used to underpin and organise learning logically.

Psychological mechanisms (internal) of learning should not be equated to pedagogical models of teaching-learning, like those based on co-operation, discussions, or experiential learning (external activities). These are focussed on the kind of student-educator, or doctoral student-adviser collaboration, even partnership, in order to provide learners with better assistance for learning and for using technologies to make learning/research more effective and to achieve the desired outcomes by saving energy and time in purposeful studies.

Unfortunately, there are also old sound in a new message caused by educator undifferentiated understanding of the subject or science to be studied, content of learning, and knowledge to be acquired. This phenomenon is evidence of the old content-oriented paradigm instead of the learner learning-centred one and provides a limited possibility of learning how to learn, as well as evidence of the complicated character of paradigm shift.

> *"Note that 'knowledge' is used as a synonym for 'curricula content'… We disagree on the following: the disciplinary concepts that we consider should make up the curricular content should not be regarded as synonymous with knowledge. Knowledge is the product of dynamism between conceptual resources, skills, and attitudes. Therefore, a competent person or society applies with skill and an accurate attitude, essential disciplinary concepts of human knowledge to face the challenges that life poses optimally" (Collar & Colín, 2021, 5).*

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4.4. DOCTORAL STUDENTS' CREATION OF CONCEPTS THROUGH RESEARCH

4.4.1. Unachieved Goal of Education

Subjective reasons. Transitions in higher education and doctoral studies, as well as paradigm shifts start with educators' understanding of what, why, and how changes should be implemented. It is a matter of philosophical and theoretical conceptions that make educational changes happen. Doctoral studies empowered by research must include conceptualisation and concept-creation (also concept-generation) at the core; doctoral students usually suggest research-based changes that should be reflected by concepts and their detailed description.

By discussing how the understanding of conceptual change has developed over the three decades preceding the Millennium, the researchers R. Duit & D. Treagust (2003) introduced some alternative approaches in analysing conceptual change. They emphasised the importance of learning concepts and provided guidance, which can lead to a powerful framework for improving teaching-learning through changing concepts in a specific digitalised environment. These considerations, which might be useful for doctoral students to improve concept creation through learning and research, are mainly attributable to subjective factors and causes.

Although each research aims at conceptualisation and introducing new or renewed categories and terms; alongside the very valuable doctoral studies there are also those that show only limited concept development, in particular when describing the shift in the pedagogical models. This can be due to several reasons, among these, there can be reasons dependent on underdeveloped skills relevant for the current circumstances:

- too narrow research problem;
- limited description of the paradigms to be changed;
- limited description of the scientific method;
- poor design of the research;
- limited time allocated, especially when the time for doctoral studies is shared with time for work to support family;
- the researcher's limited vision;
- weak higher-order thinking;
- poorly defined or described the notions used;
- undifferentiated concepts such as knowledge and learning content;
- undifferentiated texts used in learning and knowledge (Duit & Treagust, 2003).

It is worth mentioning researcher's knowledgeability and scientific advisors' experience in supervising doctoral investigation, assistance in the description of the scientific method and data processing, the evaluation of responses to the questionnaires

used, and other research tools that are chosen or created to investigate the object of the research. Meanwhile, the doctoral students are responsible for what and how they do, what ideas follow by their investigation and submit for the defence.

Educators and doctoral students recognise the importance of personal qualities, but these are poorly integrated into academic goals and are usually mentioned at the end of the list of skills or competencies. Even if the program descriptions provide opportunities for the development of students' personal qualities, this goal tends to be missed during the practical implementation of the programs. Socialization, the development of a person's individual moral qualities, researcher ethos and responsibility, achievements in attitude and value interiorization is more complicated to evaluate and take longer than knowledge creation.

The contradiction will live as long as the programs are designed and implemented on the knowledge-base and content-centred with comparatively large informative component instead of students' getting acquainted (informed) with the content of suggested or selected sources before online or on-site classes when discussions, dialogues, team knowledge-creation etc. are dominating strategies. The paradigm shift in the program/curricula design, especially in its implementation part will bring about considerable changes in university process and even in the education system.

For doctoral students (Ph.D.) it would be wise to distinguish between broad philosophical or fundamental concepts that denote the researcher's world-view and general educational approach, as well as concepts that represent subordinate and more detailed phenomena. The term "21st-century skills" is generally used as a synonym for certain core competencies such as critical thinking, problem-solving, collaboration, and digital literacy that provide deep understanding, as well as concept generation and their detailed description.

Some of the objective reasons. Current education targets are complex and broad. They cover not only specific skills but also relevant personal characteristics of educators and students. In a broader sense, however, learning in the 21st century opens up wide-ranging discussions and interpretation that is evidence of conceptual and theoretical uncertainties. These start with the question whether lists of competencies published by influential and authoritative organisations, as well as knowledgeable researchers, are a sufficient goal of education in the digital age.

The role of society and the cultural environment in personal development is undeniable. This is a time when neither the famous universities with the signs of the old paradigm in curricula creation and rigid internal system, nor the best schools, nor open information resources alone will be able to achieve the educational goal appropriate for the age - to achieve coherence between the set forth humanitarian goals of education and their dominant functioning in the society.

The external environment interferes with growing violence in the world, poverty in many and vast areas of the world, depression especially among young people, global

fighting for income and power, and finally, for the good of humanity, and rapidly evolving digital technology is being used with equal force for fraudulent and other anti-human purposes. These do not convince young people of the ability of many progressive initiatives to strengthen respect for humanity, individual development and to triumph over injustice. The difficulties and challenges faced by young people in particular often overshadow people-friendly social conditions and the supply of technology.

The digital revolution has changed societal culture and the educative functioning of the environment. This revolution, followed by the overriding positive evaluation and priority given to digital technology in education, economics, and in exciting gaming programs is not balanced by the development of concepts about the already existing, and potentially even more severe disruptive effects of technology in the absence of the dominance of ethical components.

A current target of researchers and scholars is the re-conceptualisation of the societal environment and human attitudes towards it, as well as a re-conceptualisation of the educational functioning of the environment. Addressing the conceptual change, it is worth remembering the claim by N. Maxwell (2008):

> *"Humanity faces two absolutely fundamental problems of learning: learning about the universe and ourselves and other forms of life as part of the universe, and learning how to create a genuinely civilized and wise world. We have solved the first problem of learning. We did that in the 17th century when we created modern science. But we have not yet solved the second problem. This puts us in a situation of unprecedented danger. For as a result of solving the first problem and creating modern science and technology, we have enormously increased our power ... to act to enhance human welfare in endlessly many ways. . . But in the absence of the solution to the second problem of learning, these very successes, the outcome of our enhanced power to act have, as often as not, led to harm and death" (p. 1).*

Pedagogy is a science and a vast field of practice, which together with the science of management, has the best theoretical basis for obtaining a formal education. Nevertheless, education alone, even if equipped with smart pedagogy, will not be able to address the second problem. This is a weighty problem that can be solved by placing education with smart pedagogy in the centre of the whole social system and cultural environment, with research-based programs for the individuals' and society's enhancement, didactic materials that strengthen the learners' autonomous learning, develop higher-order thinking, and facilitate learner choice by providing smart guidance, philosophy-in-use to generate concepts about the world, human activities and responsibility.

The digital revolution challenges the cultural revolution, which might occur through integrated transitions in the whole of society: political culture, economic culture, education culture, etc. Responding to objective and subjective reasons of gaps include deep learning and concept generation to obtain adequate learner understanding of the current processes and their personal responsibility.

Concept creation comes about as a consequence of changes in the world we live in; understanding of what is being learned is represented by concepts and language in general that is necessary to understand and use the newly acquired knowledge of the things and processes around us.

The conceptual shift in pedagogy should follow deep understanding of what it means to prioritize Maxwell's second task, or prioritizing the educative goal of learner individual development when education is a powerful tool for socialization and development of the appropriate for life and work personal qualities. Learner individual development becomes central in education at all levels while deep learning provides quality of concept understanding and is necessary for all; it is especially essential for students and educators who will bring these qualities to work-places, schools, and further learning.

Deep learning of doctoral students. I would like to accentuate the centrality of doctoral students' deep learning as relevant for concept creation at this level of education and research. Deep learning has been suggested versus instructional education, and concept learning is concentrated on in doctoral studies as the core of deep learning. "Situativity' and cultural context of learning mean that knowledge is not just a static mental structure of individual learners. Knowing is a process that involves the learning person and it involves other people, it actualises human characteristics.

Deep learning includes the tools in the learning environment and the activities in which that knowledge is being used. The 'situativity' perspective moves beyond a transmission and acquisition concept of learning. In addition to acquiring the content during learning, the patterns of participation in collaborative activities change over time (Rogoff, 1990; 1998) and the individual characteristics of learners change. This emphasises a new vision of group and team partnership, directed and triggered participation instead of inclusion (more adequate for special pedagogy) in learning and other activities.

Deep learning happens when several or all of the following attributes interact:

- involve higher-order cognitive processes to reach a deep understanding of core academic content;
- immersion in addressing an area or issue, often crossing disciplinary boundaries;
- integrate academic and personal/social capabilities and gives priority to those competencies and dispositions that support learning and living in the 21st century;

- is active, challenging, meaningful, collaborative, and personally relevant;
- in some way is designed to connect to and impact the world, locally or wider;
- takes place in a range of settings, but increasingly incorporates the medium of digital technologies and connectivity;
- is for all and especially for students who have traditionally been disconnected and underserved by conventional schooling (Fullan et al, 2017, 2).

Student deep learning, actually, triggers also a wide learning, as well as deeper educator further learning. It is

> *"the type of learning that results from students' self-directed application of critical and creative thinking, problem solving, communication, and collaboration to deepen understanding of key concepts in the curriculum. Deeper learning is also the outcome of those processes... (as opposed to) learning efforts that start and end with memorization of facts or demonstration of basic skills in a curriculum" Bellanca (2015. Introduction).*

When learning scientists are involved with engaging students in authentic practices and investigating these practices, they are referring to the developmentally appropriate versions of the situated and meaningful practices of experts. Partnership in team learning or investigation does not mean doing things when students are together, it means a new quality of doing things together for a common aim, synergy, and deeper learning.

Professionals use complex representations to communicate with each other during collaboration. Of course, learners at early age, even doctoral students at the beginning period of their study, cannot do what experts do, nevertheless, learners at all levels of education should be involved in authentic team practices appropriate to their experience, especially doctoral students. Practices, which are meaningful for learners are ones that identify:

- appropriate practices for the nature of the learner and learning content, that emphasise authenticity of the content and learning being expanded by using digital technologies;
- learning environment, meaningful experience-appropriate content, and process of learning permeated by digital technologies;
- originality of content and methods that confirm originality by exploring the wide field of the web, finding challenging problems, and provide the valid potential of individual development;
- appropriate in a wider context cultural value.

The developing foundations of learning science, thus, are complex: constructivism, cognitive science, digital educational technology, socio-cultural studies, and studies of knowledge relevant to each discipline. The last decades have also added neuroscience and computer science to this list. To illustrate this complexity, constructivists explain why listening or reading often do not lead to deep learning. Therefore, neuroscientists are studying this phenomenon.

The process of teaching-learning, especially its design, is transformed because of the emphasis, which now moves from teaching to learning, from instruction to partnerships in studies and research, and that introduces new relationships between educators and learners. As well, there are new ways of constructing learning situations, when knowing is a process that involves the whole person, who is involved in activities where that knowledge is being applied in teams, cooperation, communication, and partnerships.

The development of educational software fostered emerging of the new learning theory, its use has transformed education considerably, and with high speed. Paradigm shift and transitions in pedagogy followed the expanded and deepened understanding of learning. The speed of these changes is illustrated by the following developments.

The first software had been designed in the 1960s, based on Skinner's behaviourist theory – Computer Assisted Instruction (these are still in use despite the changed understanding of instruction). In the 1980s computers started the radical transformation of schools. By the 1990s there was a consensus that digital technologies and internet should be accessible at every school and other educational institution.

Since 2000, especially during the pandemic, it became impossible to analyse and evaluate the effectiveness of educational institutions without a complex process addressing several of the now transformed areas. These should be evaluated from the perspective of the transformed educational process, focussing on what and how the opportunities provided and now accessible, due to the availability of technology, can be used to update the pedagogical process. These are:

- the socio-cultural situation – intelligent flexible behaviour realised in a complex environment, an environment created by humans with high connectivity through digital tools, broadly disseminated cognition through the use of artificial intelligence, teams, the role of context in cognitive development, collaborative discourse in teams, collaboratively generated knowledge and new ideas;
- the expanded number of processes involved in deep learning, externalisation through self-evaluation and acting in complex social and technological environments – partnership teams of doctoral students, educators, practitioners from different areas, digital technologies and traditional tools, all these create a complex culture of teaching-learning, etc. – all those things that sustain engagement and provide reliable and valuable achievements.

– the online learning mode and hybrid research methodology empowered by digital technologies – experiments, observations, quasi-experiments, data collection and processing, etc. – which models, offers effective methods or approaches, and improves practice, focussing on why and how particular models improve learning and knowledge creation.

Doctoral programs are designed to lead to an advanced and original research qualification. (OECD, 2020, 22). The scientific knowledge of educators or advisers of doctoral research, their psychological knowledge and understanding of the individual development needs of learners, their knowledge and research skills in the framework of digitally empowered didactics (process of the doctoral formal assisted academic learning and research), along with pedagogical experience in assisting doctoral academic studies and research, make up their complex pedagogical knowledge-base, which manifests in a pedagogical mind-set and professional philosophy that allows for a broader and contextual view of current issues.

Digitisation in education not only facilitates the work of educators and students, but also makes activities broader, more interactive, engaging, speedy, and meaningful – provides opportunities for deep learning. Ultimately, digitisation in education has broadened the students' way of reflecting on and pondering problems, learning, knowledge creation, as well as educator modes of activity, traditionally called teaching. The latter has changed its character from the dominant direct demonstration model and requirements to initiating and facilitating learning in an appropriate learning environment created through dialogues and cooperation, even in partnership with learners and all other people involved in the face-to-face, hybrid, and / or distance pedagogical process. The appropriate and meaningful balance between face-to-face and online communication and cooperation should be pedagogically reasonable with participation instead of involvement at the core.

The researchers of the DocTDL project, therefore, recommend that doctoral students of education, as well as their scientific advisers, conduct in-depth and contextualised investigations, which might provide teachers and educators of particular disciplines with fundamental conclusions and statements for their everyday teaching activities and investigations, as well as focussing on the intersection between physical, mental (cognitive and emotional), and social environment and digital technologies in formal academic settings.

The digitalised educational process transcends traditional roles of teaching/assisting and learning when all participants are learners or teachers. In doctoral studies, the partnership between students and educators becomes the basic focus for cooperation and communication in order to successfully complete research as a joint venture. Doctoral students will find sources that investigate, analyse, and suggest improvements or deeper transitions between the separate components of the pedagogical process, more often being either learning or teaching. Didactics, which

deals with particular disciplines and their programs/curricula, usually investigate the content to generate the most appropriate subject matter and appropriate strategies of working with the content, should change accordingly.

Re-thinking of pedagogy to meet the priority of socialization and individual development of learners is in process now when understanding of the general direction is clear but the bulky environment that interferes with education is heavy to redirect. Good news is that educators, researchers, and practitioners are able to create theory and practice of formal education, that is pedagogy, for its new mission.

4.4.2. Emerging Neuro-Pedagogy

Neurosciences provide deeper knowledge of learning. During the recent decades neuroscience has experienced rapid growth and has given educational researchers unprecedented access to deeper understanding of brain functioning, which is the biological background to deep learning, concept creation, and understanding. The findings have introduced a wave of wider insights into learning, thinking, motivation, emotions, and development in general, which inspired reconsideration of the existing definitions and descriptions of educational sciences. The turn of the millennium has been marked by the birth of *Developmental Neuroscience* (Johnson, Munakata, & Gilmore, 2001), *Social Neuroscience* (Cacioppo, Viser, & Pickett, 2005), *Cognitive Neuroscience* (Gazzaniga, Ivry, & Mangun, 2002), as well as *Educational Neuroscience* (Campbell, 2011; Thomas, Ansari, & Knowland, 2019).

This is undoubtedly a significant step forward, although neither educators nor doctoral students should expect direct educational improvements. Neurosciences belong to biology and use its notions to explore their specific object of research and define findings. These achievements should be used as the biological basis for the functioning of the human brain and need to be translated or interpreted using educational terminology, in order that these achievements may help improve or transform learning and research expressed in pedagogical terms.

> *"Educational neuroscience is an interdisciplinary research field that seeks to translate research findings on neural mechanisms of learning to educational practice and policy and to understand the effects of education on the brain. Neuroscience and education can interact directly, by virtue of considering the brain as a biological organ that needs to be in the optimal condition to learn ('brain health'); or indirectly, as neuroscience shapes psychological theory and psychology influences education" (Thomas, Ansari, & Knowland, 2019, 477).*

The researchers (Thomas, Ansari, & Knowland, 2019) consider how and why a psychological approach that ignores neuroscience is at risk of being misleading for educators. As well they address the arguments in favour and against the relevance of neuroscience to the theory and practice of education, especially of using methods from neuroscience for diagnosing individual differences.

Theories of neuroscience, like theories of psychology, cannot be directly used in pedagogy. These need to be translated into pedagogical terms with further transition of the content of pedagogical notions/concepts and theories. This is a strong warning for researchers to use findings from neuroscience correctly in pedagogical investigation, theory and practice. Education science (social science, uses such terms as connectivity, understanding) and neuroscience (a biological science that is tailored to describe physical phenomena) are quite different sciences, but this can be bridged if researchers have a deep understanding of both disciplines. Neither of these sciences can replace the other, even educational neuroscience cannot replace pedagogy.

The object of research in neurosciences is narrower when compared to pedagogy, therefore, description provided of its goal is more detailed, even microscopic. The notions of these sciences are defined and described at different levels but both sciences, each in its own way, contribute to a better understanding of human learning opportunities. The goal of research in neurosciences does not provide a direct answer to what pedagogy wants to know - namely, the social context, which is especially important for the science of pedagogy.

Today, there is another phenomenon, which needs to be combined with education and is already linked to neurosciences: that of digital technologies. Traditionally we perceive digital technology as a pedagogical tool. Meanwhile, it is a many-facetted tool that interferes with the functioning of the brain, transforms learning itself, the learners' thinking, interferes with generating concepts, and mindfulness. The researcher's knowledge of the structure of the brain and structure of the computer does not provide a direct answer to questions important for teaching. Educators' and doctoral students' comprehension of the main achievements of computer science and neurosciences, will support learners' autonomous learning, and student research. Doctoral students will distinguish between research as a form of learning with digital technologies and planned research as a mental activity in a social environment that is performed to acquire new knowledge.

It is clear that the most effective outcomes will result if researchers of neuroscience, pedagogy and computer science join in their efforts to bridge these theories and practices. This seems to be a highly creative undertaking that utilises and develops higher order thinking, creates responsibility through recognition and self-evaluation of one's creative strengths, actionable cognitive capacity, and mindset.

"Concept learning, the ability to extract commonalities and highlight distinctions across a set of related experiences to build organized knowledge, is a critical aspect of cognition… Over the last few decades, a wide range of cognitive processes and brain regions have been implicated in concept learning, including those related to memory, reasoning, decision-making, and reward processing… Current neuroscience research has begun to move past the system-level dissociations toward developing computational theories to test specific candidate mechanisms for brain regions involved in category learning" (Zeithamova et al, 2019, 8259-60).

4.4.3. Topicality for concept-generation

A complex mental process. Concept creation or generation (doctoral researchers will make these notions clear) is among the top achievements of a researcher and a must for a doctoral student - a highly conscious, informed and knowledgeable, guided, and self-guided process. Concept creation through learning as a complex mental process that happens in the brain at the neural level in created settings and demonstrates a paradoxical but real phenomenon when the biological connects with the social, when human social nature and biological nature interact with human development, when student and educator better understanding of concept creation motivate their further learning.

This is why learning usually requires a major effort from the learner. This phenomenon is being studied by *Educational Neuroscience*, which should be informed by, but not geared towards identifying, the neural mechanisms underlying and accounting for cognitive function and behaviour, which is the task of cognitive science. The so-called 'binding' problem remains a fundamental problem for *Cognitive Neuroscience*, not so for *Educational Neuroscience* (Campbell, 2011). Even if underpinned by neurosciences and empowered by *Computer Sciences*, the science of pedagogy still investigates its specific objective (that is not investigated by other sciences) and evaluates findings according to pedagogical criteria. The pedagogical objective of research and the criteria for evaluation of findings belong to the core of the science of pedagogy, currently empowered by *Neurosciences* and *Computer Sciences*.

The contribution of Neurosciences is still a topic of hot debate. Now we know that not only cognitive, but also emotional, responses can be traced down to physical brain activity and demonstrate the complex nature of the activity of the human brain.

The binding component within the complex relationship between what we think, believe, and do in education is language. Ironically, it is through the use of language that self-reflection and the exploration of ourselves (and our preconceived beliefs), others, and our interactions with others happens, that leads to a paradigm shift in

thinking and practices in education (Tuhl, 2019, 157). The quality of language at a doctoral level does not mean only correct grammar. Quality is reflected by the terms, notions, and academic language used, which not only demonstrates the researcher's knowledge, but allows experienced scientists to understand and recognise the ideas.

This has been mentioned here with a twofold aim: to remind of the complex character of concept learning and to accentuate that speeding up learning by digital technologies requires appropriate knowledgeability, understanding the complexity of learning, and wisdom in making clear the conceptual basis of research, as well as its contribution to further concept generation. Knowledge of neurosciences and digital technologies, which is integrated into doctoral research, new knowledge generation, pedagogical concept creation, and making the achievements of the research accessible to other researchers and practitioners, also changes under the influence of digital technologies. Deep knowledge creation requires in-depth knowledge of the logic of educational research in order to develop the pedagogy of the digital age.

Another considerable component is that of learning how to conduct research, which is appropriate for the doctoral level, autonomously render the graduates' capability of becoming educators.

Some parallels should be identified between:

- education, with the focus on the pedagogy of concept generation through doctoral student academic studies and facilitated research,
- neuroscience, to prompt how conceptual change might make concept learning more efficient, and
- how digital technologies function as pedagogical tools in terms of affecting concept generation.

This is just a statement and cannot be proven or refuted by the current investigation, as well as our current understanding, which recognizes that what is still unknown will happen at the neuronal level in students' brains, as they think digital technologies are significantly changing learning opportunities.

The brains of learners have been empowered to become better learners and have a greater learning capacity; this is becoming clear from learner achievements, improved self-confidence, and greater satisfaction of learning and research. Australian schools (our previous project INOSOCTEREHI examined this experience in 2016-2018), as well as a growing number of schools in other countries, are using neuroscience-based teaching-learning and learning-enhancement technologies. They are at the leading edge of changes that can transform formal education at all levels and move beyond this to the wider society by creating appropriate interaction between formal and informal education. Doctoral students should not be re-discovering this. They should, rather, become acquainted with the incentives, environment, pedagogical assistance, and other factors that are culture-specific and create their vision of such improvements in their own country.

If the concept-generation were studied by doctoral students in more detail, this might provide them with some suggestions for the possible integration of findings from neurosciences when translating relevant terms into pedagogical notions. Meanwhile, it is time to ponder a bit if the concepts of neuroscience are translated or transformed into pedagogical concepts.

With this in mind, doctoral students should aim to address neuropsychology, as well as the emerging neuro-pedagogy. The latter will provide researchers and practitioners with deeper understanding of learning and concept-generation.

> *"Educational neuroscience is evolving at the interface of neuroscience, cognitive sciences and education, and even if education focuses solely on enhancing learning and the neurosciences solely on brain mechanisms involved in learning, the future of education and the neurosciences are tied together: educational practices are being and will continue to be transformed by science" (Frith, 2011, as quoted by Lalancette & Campbell, 2012, 37).*

The frames of the DocTDLL project did not allow for a wide analysis of the issues. The project team, therefore, focussed on discoveries that could stimulate further research by doctoral students and educators, prioritising digital learning and concept development suitable for doctoral studies, synthesising neuroscience and digital technologies, and creating pedagogy for the digital age.

Neuroscientist S. L. Miller (2017) points out that by merging three processes, educational neuroscience is fuelling a revolution in e-learning. These are suggested here for consideration by doctoral students for their research:

- speeding up breakthroughs in neuroscience;
- inappropriate current e-learning approaches;
- the increasing power of computing technology.

Human behaviour triggers changes in human brain activities (Patten & Campbell, 2011, 9-10). This is a clear invitation to design pedagogical provision accordingly and facilitate learner brain activity. Neurosciences become especially important in designing processes for deep learning and concept generation in a digitalised education environment.

Human thinking becomes possible through concepts, which are mental representations of things or phenomena, expressed by a single word or constructions of several words, be these learned without or with digital technologies, using suggested activities in text books or authentic texts. Concept generation is evidence of deep learning, an essential contribution of doctoral research, therefore, should be addressed by the doctoral academic studies and research.

Deep learning is a term that can mean many different things following different approaches and definitions for further investigation and discussion. In any case, researchers believe that complex problem solving, critical thinking and creativity as required outputs from schooling (Mehta & Fine 2019; Turner, 2021) or a widespread availability of digital tutors can make learning effective and even free teachers from the repetitive or other simple activities of teaching (Senjowski, 2018).

The adequate for the upcoming decade skills that include meaning-making and computational thinking, connectivity and deep learning concerns a radical re-positioning of the learning relationships among all the major players including educators – a wide field of doctoral investigation.

"Additionally, deep learning focuses on a set of fundamental learning outcomes that represent a system change. It is for these two reasons that we view it as an emerging 'social movement'" (Fullan et al, 2017, i). In the substantial review of the research literature (Pellegrino & Hilton, 2012), define 'deeper learning' as the process through which an individual becomes capable of transferring what was learned in one situation and applying it to new situations. This goes beyond the previously defined 21st Century skills (Bellanca, 2015) and should be attended by the appropriate educational content and pedagogical assistance to learning empowered by neuro-pedagogy.

Incorporating brain science into the classroom doesn't mean forgetting everything known as an educator or doctoral student. It's simply about deeper understanding of the 'what', 'how' and the 'why' behind the most effective ways to teach, learn, investigate, and then purposefully using this knowledge, practical tools, and strategies to improve wellbeing and academic achievement, simultaneously (Caldwell, 2020). The practice of ignorance is becoming irresponsible, damaging, and demanding of changes, paradigm shifts, or education reforms.

Obsolescence of knowledge and skills. The concept of the 21st century educator and student skills has been dominating for two decades in rapidly changing education, under the pressure of digital technologies has become out of date to some extent. This phenomenon addresses educators, researchers, and doctoral students to investigate the current development of the key concepts and terms used by researchers and practitioners, establish discussion points from which educator and researcher competencies could be discussed and the related concepts updated

Re-thinking doctoral studies and research include, therefore: generating new knowledge, concepts, and technologies of investigation with digital tools; research and doctoral student supervising as the core way of educator lifelong learning; high diffusion of research results and practice is a demand of university and school, university and enterprise networks.

Researchers and educators use academic language while practitioners are willing to accept more practical terminology that makes updated definitions of particular importance. Learning and development professionals and educational researchers now

have the possibility to widely use the web of comparative studies and acquiring a more thorough understanding of the theories and concepts that underpin learning and understanding of cognitive processes empowered by digital technologies.

The project DocTDL confirms that people are far more motivated to change their activities and to adopt new ways of working when they gain insight from their own experiences coupled with educator clear presentation of theoretical statements. Creating insight requires a very different approach to delivering information and the information needs to be put in a context, which is meaningful for students, as well as educators as learners.

If educators wish students go beyond conceptual transition and step into proficient, or even an expert's, level of skills or competencies, they should help to promote meaningful student activities and require them to be prepared to change their opinion. As well, they should be prepared to integrate the newly acquired knowledge into a network of thought to the extent that corresponds to their current abilities and encourages them to construct further concepts (Zirbel, 2008).

Moreover, conceptual change does not mean only learning more. It is about deep and meaningful learning that is achieved by the connectivity between concepts.

Researchers have to pay attention to the formation of a concept and conceptual change to actually discover new ideas. The research, therefore, as well new pedagogical models, should include the steps involved in the conceptual change that helped to integrate it into each student's neural network and personal character. It should show how and under which conditions a concept is created in a given situation by using digital tools and how the new considerations may lead to new conceptual constructions, ideas, and discoveries.

Listening and reading, represented by language are relevant activities and from time to time are chosen for doctoral research, but these in themselves are not an indication of learning yet. Concepts originate in a diverse set of personal experiences, traditions, the socially cultivated values supported by the social, cognitive, emotional, and physical space to which the learner belongs. The appropriately equipped environment/space facilitates and makes possible consequent quality steps of concept building. Each of these expects to be identified, self-controlled, and completed to obtain the desired result, preferably understanding. It is more likely that even the doctoral student's learning is easier when prior knowledge and specific networks of thought already exist and more difficult if new networks must be created. Generating learner prior concepts might involve the creation of new neural networks in the brains of students, as well as reactivation of the existing neural circuits or changing those that have become inadequate.

The student's and researcher's mind, as a function of the brain's work, has to go through well-known processes, which should be described in due detail if empowered by neurosciences and digital technologies:

- identifying and understanding the problem, gap, or discrepancy;
- adopting additional information and fitting it into already existing neural networks;
- rethinking arguments critically, interpreting and rearranging flood of ideas, or incorporating a new idea.

The generation of concepts takes place at the same time as the development of academic language with such development being a special goal of doctoral studies. Academic language reflects the quality of thought, the ability to generate appropriate concepts, and the capability to generate research-based theoretical statements. Researchers (Loosly et al., 2012; Roelfsema et.al, 2010) distinguish four key cognitive skills that work together with language skills and develop learning capacity: attention, processing rate, memory, and sequencing. These experiences are represented by a language, reflect an individual's learning capacity and impact the architecture of the brain. At birth, the human brain is in an amazingly unfinished state and much depends on the learner's activity (Tuhl, 2019). The experience of doctoral students allows for deep understanding and concept-generation with novel content. This capability is one of the criteria of a scientists-in- making.

Managing one's emotions is one of the key skills of being an effective learner. Self-regulation is one of the most important behavioural and emotional skills that people need in their social environments. Emotions direct (or disrupt) psychological processes, such as the ability to focus attention, solve problems, and support relationships. Adult experience allows them to consciously meet the challenges of the environment and improve or create new environments to make them more personalised (OECD/CERI, 2007).

This is what learners experience when they complete new cognitive tasks that need to be coupled with new complex technologies. At the same time, both agents, tasks and technologies, demand appropriate prior knowledge and skills, have experienced the increasing role of technological flexibility, the prevalence of emerging challenges, demand 'run-time' (Blayone, 2020) provided by digital technology and quick decision-making that demands knowledgeability. In other words, the more often connections occur the stronger they become – the circumstances when all four aspects of a digital environment (or space) are involved are:

- Physical (new digital equipment or it's functioning);
- Social (communication & cooperation);
- Cognitive (conceptualization of a new phenomenon); and,
- Emotional (anxiety, happiness, joy, satisfaction – feelings that affect with attitude).

It is not surprising that the brain is often compared to an advanced computer. Neurobiological phenomena are a special topic within learning. If a doctoral student wants to understand these mechanisms, he/she can explore them in more depth, for example, study how the structure of the brain changes throughout life, influences learning, is affected by the acquisition and storage of knowledge and skills, or how unused connections are eliminated. Doctoral students in education need to use this framework to develop an appropriately modified pedagogical process.

Meanwhile, there's a trap here for the researcher: it will be much easier to think in an already known way than to accept the challenge to think in a new way - the biological background becomes activated by the process of evaluating the signals. The conclusions we reach will also have an emotional component (LeDoux 1999). The formation of concepts and belief systems is thus a rather personal and grounded experience even if achieved through team learning – doctoral researchers have to keep in mind that internal qualities are developed under the influence of the agents of the external environment. Thinking in a new manner means using a social achievement such as language in a new manner, expanding the content of already well-known concepts, generating new concepts and connecting notions in larger concepts, which demonstrate the quality of the language.

The good news is that new patterns of activities and new concepts CAN be learned, but it does require work. In other words, new concepts cannot be "adopted", simply memorised. They have to be fitted into existing networks and go through all the emotional filtering and evaluation processes first. Even if a newly taught concept might sound logical, it can only be employed after a new network has been established. This phenomenon underpins learning-by-doing, partnerships in team-based activities that trigger evaluation and self-evaluation, exchange of views, dialogue, critical thinking, etc., and by doing so make learning effective and less time-consuming.

If the fit is good, meaning is given to what has been learned previously. In other words, learning on the level of concept-generation becomes meaningful. If not, confusion may occur. Developing new skills and different thinking patterns requires the formation of additional networks and the enhancement of language.

The claim that concepts can be expressed in their simplest form in a single word and can also represent an abstract set of ideas may seem too simple, nevertheless, in practice it seems difficult to achieve, especially when a doctoral student analyses the data required for new theoretical knowledge and needs to express it in appropriate academic and subject-relevant language. This usually happens when the doctoral student writes a research-based article. Using language, individual concepts can be connected to build more complex language structures (Carey, 2000) or new concepts, which can exist in isolation and describe a whole idea when generating theories – concepts that help us to draw conclusions and explain even more complex ideas, which require deep understanding.

For those doctoral studies, which are based on neuro-cognitive sciences, thinking and deep understanding generally refers to how concepts are "represented" in the student's mind and most importantly how they are "connected" with each other (Grotzer 1999). In simple cases these generally are generated in the form of images, while abstract and complicated situations – take the form of models. The academic language, which doctoral students use to present their understanding reflects their knowledgeability. Deep understanding then means that the concepts are well represented and well connected. An expert in a particular field might not just have more knowledge or information, but the knowledge he/she has is well connected in a logical and meaningful manner.

This is important because a deep understanding of a problem or other phenomenon involves the ability to recall many connected concepts at once, where every single concept has a deep meaning in itself. Experienced researchers will suggest drawing 'spiders', concept maps, charts, tables – their digital format allows for quick modification, correcting and identifying possible and real connections.

The possibility to get quick feedback, followed by prompt decision-making, provides a successful self-directed process for generating concepts. Deep thinking then involves the ability to make further connections between the webs of neurons and concepts expressed through language. The construction of new concepts almost always involves student and researcher knowledge, beliefs, and modes of thinking. When a learner or researcher makes sense of new findings and knowledge, he/she can make further connections between different concepts. He/She demonstrates, and further enhances, his capability.

One more important consideration: a new concept or view might seem rather strange and resistant to change because, at the neural level, it has to establish new connections. Mastering or depicting an unfamiliar phenomenon in a language full of unknown terms and trying to understand the topic conceptually, this already poses a major challenge that either involves a lot of neural activity or blocks it. Unlearning misconceptions is significantly more difficult, even if the learner has an inherited trait for creativity, generally, it is at about 50% (Pinker 2003).

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4.5. MAKING DIGITAL TECHNOLOGY A POWERFUL PEDAGOGICAL TOOL

4.5.1. Digital Transformations in Pedagogy

The strategic shift is caused by the people world-wide, diverse, and versatile cross-cultural connectivity, that involves the whole social system, create external and internal environments of education (OECD, 2009). Much has been written about the priorities of digital technologies, as well as warnings for proper use and practical activities to exercises correct usage of technologies. Here we will try to spot out some essentialities that should be taken into consideration by doctoral students and their scientific advisors.

The Science of Pedagogy as a theory and practice of organised modes of education has a developed internal structure and integrity that is sensitive to changes in the external environment, thus the influence of digital technologies creates changes that are reflected by the whole of its structure. Digital technologies provide wide connectivity with the external environment with technology as a powerful tool for transforming and facilitating learning and teaching, as well as adapting the most progressive learning experiences to meet the needs of all learners, advancing relationships between educators and students, which are demonstrated and further improved by cooperation and partnership, communication and connectivity that can provide many other possibilities.

It is hoped that doctoral students will be more receptive to researchers' observations world-wide on the most pressing issues posed in education by the transformation of pedagogical assistance due to the advent of the digital age.

Humans can solve two unwieldy problems (Maxwell, 2008, 1):

The first, when they internalise knowledge, master powerful knowledge and skills, and responsibly use this power in favour of people and the environment. For this, mankind has to commit to a shift in thinking from prioritising income and money to prioritising human values.

The second, but unresolved, problem has always been one of the main goals of pedagogy in Europe, and it is gaining in importance alongside the growing body of knowledge and access to it through the wide variety of digital technologies. Pedagogy must now shift the emphasis from knowledge and skills to educational activities with cultural and moral values that are created through learning, knowing, acquiring skills and integrating assessment activities.

Attitudes to natural and social environment, self, human activities, and values created by Nature and human intellectual and physical energy become the lens through which human activities should be filtered. The tripartite pedagogical aim – educational (knowledge and skills), developmental (inherited and learned abilities) through all

kinds of learning, and educative/socialisation (attitudes, values, etc.) have not lost their significance. Even more emphasis is placed on educational goals, the learner's individual success and values, in order to strike the right balance between these goals, in particular between the power of knowledge and the power of its responsible use.

Shifts in pedagogical processes. Changes of the external environment introduce shift in the knowledge and skill assessment, content of education, knowledge, and knowledgeability that require treating knowledge and skills or competencies as a precondition of educative and developmental goals; knowledge is still of value if it leads to better doing and behaviour demonstrating high quality socialisation with due moral and aesthetic values.

Digital technologies allow one to find, select, and prepare for use in formal education unlimited sources for knowledge and skill creation, as well as emphasising technology's contribution to the development of learners' attitude and other individual characteristics. This possibility makes formal education merge with non-formal and informal modes, as well as re-think educational aims, content, evaluation, and process design in favour of learner self-conducted activities that implement shift from normative, educator- or content-centred process to a learner learning-centred one with stronger connectivity in partnership relations.

If we return to The Activity Theory, we can clearly identify learning as one of the basic activities that learners do to obtain new knowledge and skills. But these are not the final targets of learning activities. Learners acquire knowledge and skills to reach higher levels of personal development and socialisation, which is the core target in a rapidly changing and connected world. This priority within educative targets in formal education creates a shift in the whole pedagogical process. The vision of socialisation makes educators and learners select the content of teaching-learning so as to acquire knowledge and moral values appropriate for life and work in the current changing world. As well, digital technologies are used as tools, to highlight the transformations and knowledge, which serve socialisation. All this make educators learn in a non-stop mode and be ready to role exchange with their students and research partnership with their doctoral students.

External possibilities and challenges. Imagine you are a learner who uses binoculars to complete your homework assignment and want to learn more than the programs and standards suggest. One lens will show you the world through your prior knowledge and skills, the other will let you see and critically evaluate the world through the lens of your attitudes, common human values, cultural traditions and other individual needs that you meet and experience. Knowledge and skills may demonstrate the individual's intellectual power and vision to operate; people can strengthen their power of knowledge and skills by using digital tools and use these to change the environment according to their individual needs. The other lens will remind of the values common among other humans in the social and natural environment with certain

demands towards individuals, their humane qualities, and behaviour to maintain an appropriate balance between knowledge and attitudes. The more influential that knowledge and skills become, the stronger is the demand to use them responsibly.

It is within this context that the DocTDL project has been launched with the hope that doctoral students' research, guided by competent educators' pedagogical wisdom, will strengthen the focus on the educative target of a university process through. To achieve this, there is a need to put appropriate emphasis on the underpinnings and contributions of theories, as well empirical analysis and determination of the implications of this for practice.

In this book, the theoretical framework and case studies are suggested as possible examples, without prejudice to the critical use of other theories and experiences to create original pedagogical models that are well-oriented to human values, from ideas through appropriate actions to learners ' and educators' achievements.

The most recent documents (OECD, EU, EP) and theoretical issues have sought to place particular emphasis on the second function of the institutionalised process described by '21st-century skills/competencies' in terms of 'higher-order thinking', 'problem-solving', or 'learning how to create a genuinely civilised and wise world' (Maxwell, 2008), and other terms that demonstrate a personal character-building component to education that draws on attitudes, as well as analysis, evaluation, and creativity, which are needed to form a personal attitude. The advent and in particular the rapid development of digital technology triggers the shift in emphasis in pedagogy and makes universities and schools transform their processes. Here are some pointers:

- The rapid growth of information and declarative knowledge provided by web search engines is moving from storing easily verifiable knowledge in memory to almost immediate use, otherwise the digital environment will render it useless. This phenomenon should be investigated to generate the best possible pedagogical provisions.
- Understanding based on the generation of concepts now includes more than just memorised information, knowledge and lower-level terms. This process now goes beyond the capabilities of the human brain and can take advantage of the wide range of digitally-provided "knowledge-building pieces" that can be practised early on. This becomes an important topic for doctoral studies. Even more, a part of the data and concept processing can be entrusted and delegated to digital technology and machine processing. Neurosciences will help to find the best way of assisting learners, especially in interpreting findings, as well as to further develop neuro-pedagogy.
- Growing access to new knowledge, skills, and the possibilities of being knowledgeable bring about responsibility and require ethics to use this achievement to suit the cultural setting of the social environment, the living space or services for human welfare. The higher the learning achievements,

the more important becomes human responsibility, as a synthesis of personal characteristics. This is the reason why pedagogy, in formal modes of education, has changed the emphasis in its operations. To be a responsible, cultured person is a more valuable achievement than to be only knowledgeable.

- Finally, there is growing uncertainty about the future and appropriate educational objectives such as 'digital skills', 'digital learning to learn', 'critical thinking', competencies, etc. In practical and even research terms these constitute an area with a considerable component of what teachers and even educators do not know how to teach. Digital technology makes teachers, educators, and also learners accept a shift in their knowledge. Many trust that learner facilitated mining of information on the web will cover the gap. We therefore re-iterate a return to the pedagogy of supporting learning-by-doing and cooperating on a new round.

How deep are changes of pedagogy? E. B. Castle (1961) when exploring the history of pedagogy explained the terms 'paedagogos' and 'teacher' and concluded that paidagogos was more important than the schoolmaster (teacher) because the latter only taught a boy his letters, but the paidagogos taught him how to behave, a much more important matter in the eyes of his parents.

"The one trains for school only, the other for life" (Kant, 1900, pp. 23-4).

In the knowledge and digital society, maintaining a balance between pedagogical goals becomes particularly valuable, and a shift in emphasis is a mandatory requirement, which will hopefully be done by clever doctoral students. Maintaining the above-mentioned balance is a complicated task because of the extremely pragmatic orientation of the economy and the approach to financing of educational programs. Actually, maintaining balance requires a major transformation of society, where education is still a powerful but limited tool.

A. Robin (2008) promotes his vision that pedagogy can be seen as what we need to know, the skills we need to command, and the commitments we need to make, and which justify the many different types of decisions that need to be made. Therefore, attention must be given to the complexity of pedagogy when it is applied to the social sciences and humanities. Pedagogy has developed its theoretical component along with multiple practices, modes, and models. It is both an intellectual tradition and a practical framework at the same time, a form of 'philosophy-in-use' (I dear reminding again of Hessens, 1929) involving two different dimensions:

a) educators/teachers view and understanding of the essence and development of a human being, which leads them to integrate teaching, learning, and the subject-matter to initiate the appropriate pedagogical process that fosters learners' individual development and socialisation;

b) the educators/teacher professional views, integrity, and identity that manifest in building relationships on a foundation of communication and collaboration with the learners by treating them holistically as persons in making with their well-developed self that enables them live and work in society.

"Pedagogy is not just a method. It is first and foremost the judgments made about which methods, given a comprehensive intake, will most effectively fulfil the aim of universal entitlement which underpins the comprehensive system" (Tubbs, 2012, p. 34).

Transformation is a constant phenomenon in pedagogy. It is transformation of learner knowledge and skills, their capability and attitudes that call for constant transformation of pedagogical provision and educator re-thinking of pedagogy to keep up with the current demands of the changing environment and learner needs.

D. Newman (2018) has analysed the top digital transformation trends in several industries, including education, and provides a revised vision of the current digital transformations. Unfortunately, the education sector is lagging behind the industries with adopting of new technology. Even if educators and learners are well-equipped, they often meet usage-based problems related to understanding the learner's needs and educator's skills, the learning content, and facilitated problem-solving, knowledge-generating and creative thinking, etc. The complexity of educational transitions makes digital transformations and the production of digital technology for education move more slowly than in many industries.

Until recently, progress toward this kind of transformation in the education has been dependent on inconsistent practices, tight budgets, and poorly planned activities (Impact, 2020; Newman, 2018). Planning in education system has to identify the core qualities and synthesise the following for synergy: teaching by using technology, learning with technology, leadership by using technology to create a transformative culture, assessment with technology of transformative tools and processes, as well as an infrastructure that enables access and use of technology and wider integration in the environment. All this invites one to re-visit the theory and practice of pedagogy.

The complex nature of education and pedagogy is a constant quality, it has always been recognised, and becomes even more complex with the penetrating it digital technologies. This approach is in line with the core idea of pedagogy in Latvia as a theory and practice of formal or institutionalised teaching-learning that changes according to the experience of learners, knowledgeability of educators, and the impact of the external environment. Institutionalised forms of education follow the core idea of assisting learners to achieve as much as possible by using new or more effective tools (content, technologies, organisational forms like models) in the allocated time.

The forms (individual or collaborative, face-to-face or online) and tools for providing assistance change according to the learners' needs.

The transition from paper to digitally based learning and teaching has brought many changes to the whole field of education. These are positive and challenging alongside with some unexpected, or even damaging, impacts if these challenges are met unprepared. But the previous changes came slowly while digital transformations add speed to these powerful impacts and requires agility from educators and students, especially of doctoral students.

It would take significantly more time if it is not guided by the knowledgeability and pedagogical wisdom of educators in a rapidly changing environment, when it is almost impossible to follow the developments of science and its practice when taught only through repetition. Quite often it is the educators' wisdom, which guides the use of digital technologies to reduce time in selecting content, processing of the data, and highlighting the humanistic values of the selected content, as well as using digital tools to empower partnerships through cooperation.

Educators' pedagogical thinking, which develops through complex and deep pedagogical knowledge and manifests itself in knowledgeability and wisdom, makes educators in the digital age constantly improve their capability and agility for appropriate decision-making and shifts in the process, with human values and attitudes prioritised. At university, especially in doctoral-level studies, pedagogy will seldom be based on memorising or simple problem-solving. This level requires higher order thinking and self-directed learning motivated by autonomy and the freedom to learn, which should be coupled with the assistance of educators in the form of inquiry-based and inquiry-oriented suggestions, partnership, and role interchangeability with ready-made recommendations seldom being given. In spite of some of the qualities being common among the current generation of university students, who grew up familiar with a digitalised environment, several hereditary traits and therefore opportunities based upon these are slow to change.

Despite some of the successful experiences, digital learning and teaching encounters criticism from practitioners, students, and educators who report on inconveniences due to materials not being prepared on time and the sudden change in education processes due to the move to an online mode. The online format demands at least slightly different awareness from that of methods that are paper-based, require direct observation and data recording, as well as interfere with learner attention and perception, etc.

Overall, prioritizing of evaluation demands accuracy and for theoretical and empirical data to be explicable. A knowledgeable and wise selection of tests and tables for evaluation and self-evaluation will save students and educators from serious mistakes because all that is accessible in the e-environment is prepared to follow

certain, sometimes very specific aims that might nothing to do with the researcher particular aims.

Overcoming these and other challenges is crucial for online learning to be adopted. Educators as learners and students point out some peculiarities related to addressing their perception which fail due to the speed and sometimes even quality of material display, the lack of direct communication face-to-face, eye-contact, and more. The traditional promise of saving time usually encounters time-consuming data processing and interpretation. The process depends on the educators' and students' skills, equipment, and quality of usage.

Demands towards the quality of demonstrations in formal education have not changed. To be a transformative learner and/or educator means to have the knowledge and skills to take full advantage of a technology-rich learning environment. It also means the learners' and educators' responsibility in being aware of the possible harm if technologies are inappropriately used when answering the main pedagogical questions of "what" with technologies, "why" with technologies, and how to use technologies in teaching-learning and assessment at a particular level of education. As well as determining how educators and students know if they have done and reached, what and how, they wanted to achieve.

Usually, publications on digital technology in education focus on the positive outcomes of applying technology in teaching-learning. Educators and students are well aware of the priorities of digital technology, but in certain situations they may misuse these if their understanding of the above-mentioned questions is not clarified and therefore understood. The priorities are highlighted in publications in pedagogy (see more in Beetham, & Sharpe, 2013; Laurillard, 2012, 2013, 2018; Bates, 2019; Darling-Hammond, Flook, Cook-Harvey, Barron, & Osher, 2020; programs in digital pedagogies by UNESCO, 2020; many other publications on the problem).

The EU Commission has developed an up-to-date framework concept for digital competence (DigComp) that tries to describe the complexity of education and bring about some clarity by distinguishing five different competence areas and four different proficiency levels. Other issues add their visions on the theme, for example, 5 technology trends in education to watch for (Impact, 2020): Internet of Things (IoT), Augmented reality (AR), Cybersecurity, Personalised learning, Artificial intelligence (AI) and big data. In spite of attempts in fields other than education, adaptation of these for education remains the task of educators, researchers and the universities only.

Educators and students might, in other words, benefit from clear transformations of the pedagogical process based on understanding the possibilities of the most impactful technology and transformational trends in education. Digital tools of learning and teaching are changing the way students learn through the adoption of the following and hopefully they will feature in doctoral studies and research:

The Internet of Things (IoT) - like mobile technology, including smartphones and other devices, communication platforms to reach out to students and teachers in real-time; the way in which connectivity improves learning, knowledge-generation, and skills development. Technology is value-neutral. Humans are the ones who apply values to things and processes, therefore, they are responsible for the way technologies are used.

Augmented Reality (AR) - is paramount in facilitating deep learning experiences including self-assessment. Digital technology empowers thinking, processing of information and data instead of requiring people to do this.

Cybersecurity - Among 17 industries studied, the education sector ranked as the least secure, with the highest vulnerabilities being present in application security, end-point security, and keeping software regularly up to date. Hits by ransomware, social engineering attacks, damages to emails, with educational records coming up on the black market. All this calls for more funding to protect research data, etc. (Impact, 2020).

Personalised or adaptive teaching-learning as the most effective influence on learning style, with students having more leeway over how they learn. At the same time it points to an understanding of feedback and relevant information on why, what, and how successful students learn, and educators facilitate, in order to meet the needs of the student and the requirements of non-formal education standards.

Artificial Intelligence (AI) and Big Data - With the advent of voice-to-text recognition, machines can be used to tutor students to relieve the burden on teaching staff and provide students with assistance when convenient for them. Implementation of AI and the use of big data, however, should be coupled with a strong ethical framework (Impact, 2020). Learning technology can analyse a student's input, instantly adjust the learning materials and assessments (Lopez, 2020). These should be compared with the learners' achievements to assess the effectiveness of the process, as well as whether the learner retrieves the most appropriate files through cloud-based technology and appropriately completes the activity.

Automation - especially when paired with artificial intelligence - can help educators spend less time on administrative work and devote more time to instruction, though underdeveloped skills and inappropriate equipment, as well as poorly organised environments usually make educators' work more complicated and time-consuming. A matter of particular concern is relationship development systems and “mutually influential relations between individuals and contexts” (Lerner & Callina, 2013, p. 373).

Cybersecurity issues have been analysed by researchers (Renaud & Zimmermann, 2020; Heitzenrater & Simpson, 2017; Bellovin et al., 2017) focussing on the possible harm to education when teachers, educators, and even students are used to positive trends. This area is among the least investigated ones in pedagogy.

J. Brunner (1996, pp. 44-65) wrote: "*Pedagogy is never innocent. It is a medium that carries its own message"* (p. 63). So, if pedagogy changes alongside transitions brought about mainly by the social environment, then 'its own message' or what should pedagogy convey now will include educator knowledgeability, wisdom and capability to constant shift of pedagogical provision to cause appropriate transitions in learner achievements, and the way these can be suggested to learners by the pedagogical design.

4.5.2. The Structure of Pedagogical Process

Prioritizing self-assessment and assessment in digital age. Usually, the process of human activities starts with the aim and motives – with the 'what' and 'why' undertaking an activity. A pedagogical process has its own logical sequence that in the digital age must be strongly observed. The intentional acquisition of competences in a rapidly changing environment in order to understand the aim and motive, educators and especially learners should first know what background knowledge and skills they have and what educational or other needs they experience in order to substantiate possible newly acquired knowledge and skills.

It is necessary to identify and assess the background knowledge and skills, regardless of whether it is traditional learning, doctoral research, or a serious fundamental researcher investigation of a complicated problem. Also, autonomous learning cannot start without assessment of the background experience. Actually, nothing new because every lesson usually had started with checking the learner homework and actualization of the prior knowledge to go on. Triggered by digital technologies shift in pedagogical processes make the impacts of assessment special and re-think the whole process.

The assessment-based pedagogical model should be based on the best available understanding of how students represent knowledge and develop competence (Gordon Commission, 2011, 1(2), p. 1). When successfully implemented, the digital mode of assessment can speed up the scoring process significantly. Moreover, it can bring several surprising benefits, such as improving the consistency of scoring and the possibility of providing instant feedback to students on their performance (Shin, Guo, & Gierl, 2021).

Assessment is always a process of reasoning from evidence, estimates of what a person knows, or can do, but the assessment is, by its very nature, imprecise to some degree and provides data relevant to trace tendencies of changes. A chosen model of cognition or socialization and learning should serve as the cornerstone of the assessment design process; usually researchers provide detailed descriptions of criteria and situation-related evidences both for research and operational feedback in academic activities.

Self-assessment and assessment are the process components, which are present from the very beginning up to the end of a pedagogical process. As a current priority, it has led to transforming the emphasis of the aims and tools, the current amendments focussing on cooperation in teaching-learning, to evaluation of the academic results and individual achievements of learners and educators, and is a precondition of self-conducted learning.

As an essential component of learning and teaching, the whole learning process can only change if assessment also changes or prioritizing assessment changes the whole process. It allows the quality of both teaching and learning to be judged and improved. The role of assessment in facilitating good learning environments was highlighted by the OECD Innovative Learning Environments Project (OECD, 2010). Assessment procedures in formal education and training have traditionally focussed on examining knowledge and facts through formal testing and do not easily grasp 'soft' skills, what Maxwell (2008) calls wisdom, or the second yet undisclosed aim of education – that of educative or socialization. The evolution of digital technologies is deeply re-shaping education and its environment, giving rise to the need for new competences. Skills such as problem-solving, reflection, creativity, critical thinking, learning to learn, risk-taking, collaboration, and entrepreneurship are becoming increasingly important (Redecker et al., 2013; Binkley et al., 2012).

Redecker's (2013, pp. 80-82) considerations seem appropriate for the digital transformation of both the universities' systems and students' learning. At present we stand at the crossroads of two 'assessment paradigms' and lack a pedagogical vision of how to move from the old one, the era of computer-based testing, to the new era of embedded assessment, integrated, holistic, and personalised assessment throughout the whole process of learning. The plan is for automated feedback to start being used in the 3rd decade of the 21st century, which will then be handed over to intelligent tutoring. However, the transition from computer-based testing to embedded assessment, from the phase of enhancement to the era of transformation, requires technological advances to be complemented with a conceptual shift in assessment paradigms to personalised learning. This conceptual shift in e-assessment goes hand in hand with a general pedagogical shift from knowledge to focus on transversal and generic skills, which of course require knowledge.

Currently, these two conceptually different e-assessment approaches – the 'Explicit Testing Paradigm' and the 'Embedded Assessment Paradigm' – develop in tandem to accommodate more complex and authentic assessment tasks, which better reflect 21st-century skills and more adequately support the recent shift towards competency-based curricula. Assessment will become more closely interwoven with learning, teaching, research, and will have to respond to, and respect, the pedagogical concepts on which the learning process is based.

If the embedded assessment becomes an integral part of the learning process, and digital learning environments become the main source for grading and certification, there needs to better understand of how information collected digitally should be used, evaluated, and weighted to adequately reflect the individuals' performance. If pedagogical tasks, such as assessing and tutoring, are increasingly delegated to digital environments, these must be designed in such a way that they become a tool for effective communication between educators and students.

It is also important to remember that the embedded assessment should be designed to respect and foster the primacy of pedagogy and the role of the educator. Since teachers and educators will be able to base their pedagogical decisions and judgments in a wider range of data than previously, pedagogical research-based principles for interpreting, evaluating, weighing up, and reflecting these different kinds of data are needed.

The human mind is programmed to give preference to positivist thought. Dynamic pedagogy, therefore, describes the process of teaching and learning in which assessment, teaching, and learning are inseparable processes and which build a unique pedagogical process (Gordon & Armour-Thomas, 2006).

The 2001 issue of Pedagogical Inquiry and Praxis asserted that the affirmative development of academic ability should include "diagnostic, customised, and targetted assessment, instructional and remedial interventions" (Gordon, 2001, p. 3). This conclusion expands the role of assessment and logically transforms the cycle of the pedagogical process from the traditional sequence "aims, operation with tools, and assessment" to logic appropriate for smart pedagogy of the digital age …"assessment of the background competence, aims to close the gap between the acquired experience and the expected achievements, self-conducted usage of tools and feedback assisted by educators whenever needed; self-assessment and assessment of the individual achievements" (ibid).

The traditional triangle (learner – educator – subject matter or the content of learning and teaching) remains as it has been for hundreds of years but the content and qualities of the components, as well as the modes of their internal and external connectivity change to transform the traditional pedagogical setting into the smart pedagogy of the digital age. Changes in one component usually cause adequate changes in the other two components and their connectivity making the whole pedagogical system transform.

Learner's/researcher's qualities that are essential for learning/inquiry include: the quality of the acquired knowledge, knowledgeability, digital skills, capability to communicate and cooperate online, learning/research skills, intentional self-development, positive or responsible attitude to learning and people who are involved in the process. Researchers remind that the world that young people grew up in before

they arrived at university is now filled with new technology that is integral to the way they live, think, communicate, and work (Jones & Healing, 2010).

Educator's qualities that are essential for assisting/facilitating learning and research include: knowledgeability, pedagogical wisdom and capability, the quality of academic and research competence, digital skills, the culture of multiple functioning in society by prioritizing connectivity, cooperation, and partnership.

Educators differ according to their vision of digital learners: some are convinced that digital technologies are making the generation of younger learners very skilled, and they can assist educators (Prensky, 2001). Others while accepting the learners' digital abilities criticise overgeneralisations, point to potentially dangerous effects, and request deeper studies (Bullen, Belfer, Morgan & Qayyum, 2009).

Subject matter is the complex content of academic studies and research that is submitted to changes adequate for digital age. It can be provided in paper and/or digital format, contains criteria for evaluation and tables for self-evaluation, requires the completion of informative, authentic or adapted texts, problems and hypothesis, exercises, creative tasks and those initiating other activities.

> *"Universities are required to bring to bear theoretical understandings, practical experience, critical thinking, risk-taking, creativity and intellect and to take action that publicly demonstrates and exemplifies these characteristics" (Ling, 2020).*

Internal constants of pedagogical process. Learners and educators bring values from the external environment to the actual internal environment of the pedagogical process with content modifications and accents, learning and teaching methods, used sources, through collaboration, communication, and using of digital and other means or tools, thus modifying the process according to their priorities and background experience. That is why pedagogy as teacher and educator professional and academic science and practice is a complicated and constantly changing affair.

> *"This needs to change so that the basic aim becomes to seek and promote wisdom – wisdom being understood to be the capacity to realize what is of value in life for oneself and others" (Maxwell, 2008, p. 128).*

Nevertheless, pedagogy is at the heart of teaching and learning, its mission in formal and organized education is to provide learners appropriate possibilities of self-fulfilment through learning, make learning easier, more personalized, and less time-consuming. There is need for detailed understanding of the pedagogical choices while moving beyond simplistic dichotomies like traditional vs non-traditional or direct instruction vs constructivist.

Andreas Schleicher, Director for Education and Skills, Special Advisor on Education Policy to the OECD Secretary General in the Foreword to Paniagua & Istance (2018) reminds:

> *"Pedagogical relations play out at a micro level through the interactions of learners and educators in multiple settings and episodes – which are hard to capture in a single system let alone across many – this has proved to be an elusive area for international exchange and analysis (Schleicher, A. in Paniagua & Istance, 2018, p. 3).*
>
> "*Hence, effective pedagogy requires teachers to have expert professional repertoires to support the simultaneous pursuit of the deep learning of content and of ambitious transversal competences that need to be practiced to be acquired" (ibid, p. 22).*

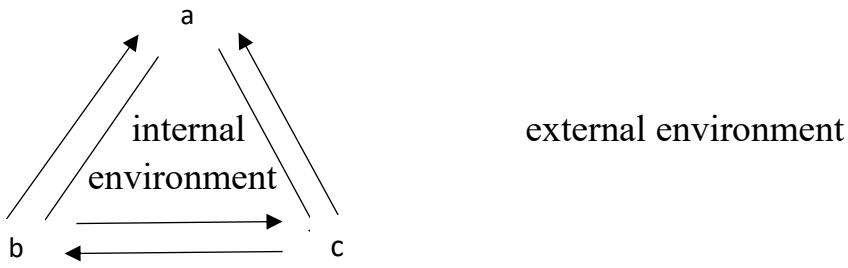

Figure 4.3.1 *Components of Pedagogical Process*

a-c: The student/learner becomes familiar with the subject matter or research problem, – appropriate basic knowledge, understanding of the possible difficulties to overcome; updated learning and research skills, both general and those related to the subject matter or problem that are relevant to cover the task; digital skills that act as learning skills and operation of appropriate equipment; dominant individual attitudes (positive, negative, being neutral) and identified ways of extracting significant benefits from the suggested and selected content, as well as internal and external environment.

c-a: Meaningfulness of the suggested content, the aims of learning/research and possible achievements; possibilities of choice, digital selection of the content and its processing to meet individual needs and expectations, accessibility of the content; informed questions for the educator and any assistance that may be needed.

b-a: The educator's knowledge about the learner, doctoral student – prior knowledge and skills, research experience; the general and situation-specific attitude to studies and research (academic or practical); use of digital skills for multiple purposes, skills inviting to cooperate and communicate in partnership, etc.

a-b: Learner/doctoral student trust, relationship and partnership, openness to cooperation and communication, and the possibilities for interchange between the roles of the teacher and learner, etc.

c-b: Suggested by educator modifications of the standard or program content to make it accessible and appropriate for learners and doctoral research; digital possibilities to integrate internal and external environment of the pedagogical process more broadly, possibilities of developing deep thinking and concept-generation.

b-c: The educators' and doctoral students' experience of delivering and assessing complex content, the educators' pedagogical experience and readiness to prioritise pedagogical capability over the subject matter (pedagogy becomes a guide of the learners' activities towards the desired achievement of knowledge, skills, individual development, and attitude) and to prioritise the educative target / socialisation.

The concept of the pedagogical process, in general terms, is defined as a systematic action or set of actions that are performed or occur with a purpose to assist learning for the best possible achievements. The process stops when the aim is reached or resources are exhausted. A smart pedagogical process is characterised by clear and achievable aims balanced with the appropriate resources with the learners' achievements and needs as the criteria of success.

> *"Although the process is a term that tends to refer to planned scientific, technical, and/or social scenarios or is part of a particular scheme, it may also be associated with situations that occur more or less naturally or spontaneously" (Procesa definīcija -latv., Process definition (2021), author's translation from Latvian).*

Research as a planned process and a kind of learning, therefore, involves its subject or subjects (those who take action of learning), traditional and digital tools, and an object of learning (content) at which the action is directed and that is changed through working with intellectual, digital, or/and physical tools (usually the research object is the whole pedagogical process, models, parts of the process, etc. improvement of which will improve learning and learner success).

In the practice of teaching-learning the learners' activities are directed at the learning subject-matter that is represented by texts, exercises, etc. that hold possible learning content, which is determined by the aim of the process. Its value should be identified and internalised by the learner (transformed from an external matter to internal achievement). This makes learning a specific reflective activity because of its aim to change/develop the learner him-/herself by development of multiple individual qualities. This makes pedagogical process unique.

The definitions of an economic process will emphasise a sequence of interdependent and linked procedures that consume resources to convert inputs (data, material, parts, etc.) into outputs. In publications related to education, some terms have been borrowed from the economic field: input, output, product. These do not reflect

the essence of a pedagogical process and should be changed to prior knowledge and new knowledge, learning or research tools, and achievements.

The pedagogical process (Procesa definīcija, 2021) is defined as developing systemic interaction between teachers/educators and students aimed at achieving the set goals and leading to a pre-planned change in the situation, i.e., the transformation of the learner's qualities, behaviour, and individual development. The definition emphasises a systemic interaction and the aim of helping students to transform their characteristics through actions.

> *Process – "systematic series of actions directed to some end, it is a continuous action, operation, or series of changes taking place in a definite manner. A natural phenomenon marked by gradual changes that lead toward a particular result, a natural progressively continuing operation or development marked by a series of gradual changes that succeed one another in a relatively fixed way and lead toward a particular result or end. A process is thus a series of progressive and interdependent steps by which an end is attained" (Mkrttchian et al (2018, p. 2).*

The pedagogical process is the purposefully organised interaction between people in order to promote personal development and socialisation both of learners and teachers. It is the process in which tasks related to teaching and upbringing are implemented, under the guidance of a teacher and which follow the theoretical principles of pedagogy. This is a typical definition of the process of formal education, it emphasises intentionality, the teacher/educator guidance, and an organised mode of activities. The process is always in development, in constant change, under the influence of the environment and actors involved.

These are possible visions of the essence of the process. Doctoral students who decide to research and further develop smart pedagogical process in the digital age will, as a result, contribute to a deeper understanding of this phenomenon. On this way doctoral students have to find the right answer to the question: "Why is transition or a paradigm shift about assessment so important for smart pedagogy of the digital age? How pedagogical process changes under the influence of digital technology?

Education is a specific field where shared and conflicting viewpoints, beliefs, and philosophies meet and give rise to shared, improved, or different pedagogical approaches. This process also often demonstrates some distortion of seemingly clear and objective evidence and triggers discussion – a powerful basis for further improvements. It is a field where highly experienced professionals meet with the younger generations, who demonstrate their ambition, but as less experienced researchers in the making. The emphasis in educator activities, therefore, should be

re-focussed from their involvement to participation, engagement, and partnerships, with self-assessment and assessment guiding students and educators.

Progressive ideas anticipate wise implementation. In its course descriptions, the newly licensed doctoral program in Latvia in Education Sciences, describes student engagement, outcomes, results, criteria, and examples of evidence. The program is written using updated terminology. Meanwhile, these phenomena and the terms are also experiencing transitions and transformations of the content they used to hold in traditional normative pedagogy. When this paradigm or approach is implemented, these are educator suggested or student chosen strategies that are either following the old traditions or shift to learner-learning-centred, inquiry-oriented, inquiry-based learning and desired success. Implementation demonstrates the effectiveness of any program, and provides broad opportunities for doctoral research.

Student engagement, the degree of attention, curiosity, interest, optimism, and passion that students demonstrate through their academic studies and research, as a phenomenon in education has become relevant alongside the intensity of education reform. Note, that doctoral research like their academic studies is educator assisted, therefore, regularities and principles of pedagogy operate there (more on principles in digital era in Žogla, I., 2019).

The motivation behind doctoral students' learning differs from that of undergraduates, and especially of school learners. With the advent of digital technology, modern data systems, research techniques, and the transformative nature of technology should to be investigated at least in three dimensions:

a) optimal usage of the transformative qualities of digital technologies;
b) reflection on how these transform learning, research, and educator provided enhancement;
c) how the available or explored/discovered new knowledge and skills are specifically used, or why not used, in pedagogical processes in academic studies and/or research.

These dimensions help to follow a special goal for research, because motivation might change considerably during the transition to online activities, which are now dominant, with digital technologies having a stronger impact on all components of the university process.

Traditionally, student engagement is demonstrated through questioning, interest, or inspiration, cognitive and practical observable activities, responsibility, attitude, perseverance, work habits, and self-regulation. These demonstrate intellectual, emotional, behavioural, physical, social engagement, as well as the impact of the quality of the program/ curriculum, the professional philosophy of educators, and their views on what qualifies as quality engagement being a subjective factor.

While the concept of engagement looks uncomplicated, it can take different complex forms in practice that researchers have to attend to, identify, discuss, and

improve. Among the most common demonstrations of engagement are evidence-based learning, practical activities, learners' questions, activity in discussions, decisions, reasonable choice among two or more possibilities (like theoretical sources, research methods, or tools), and evidence-based instruction/ teaching/ enhancement.

Focusing on the student skills of autonomous learning and research, the non-cognitive individual features become as important as the learning/research cognitive skills. This changes the balance between quantitative and qualitative data in research, with a stronger emphasis on qualitative methods of investigation. The latter is in line with the learner-learning-centred pedagogical paradigm that is based on the assumption that an individual's capability is more effectively enhanced through empowering oneself by doing.

Scientific representation of doctoral research. Doctoral students, when identifying the contribution of their research, often suggest the practical implementation of research-based pedagogical models. It is worth remembering, therefore, that pedagogical models are best understood as functional entities that synthesise the theoretical underpinning of practical activities in order to improve the situation being investigated.

Models can instruct educators, teachers, and learners about the nature of reality only if they represent the selected parts or aspects of the reality that the doctoral student is investigating. This raises an important question: Due to what, do theoretically well-based models represent their target that usually is represented as a quite complex system (doctoral students often choose complex phenomena to invest a substantial contribution)? Their scientific advisers usually pay much attention to draw a well-identified framework of the research.

Scientists operate with tacit assumptions about the ontological status of models while doctoral students usually lack this quality alongside comparatively small researcher experience. This gives rise to what has been called the folk ontology of models, according to which models may be thought of as descriptions of missing (non-instantiated) systems. There is a close affinity between this view and recent philosophical position according to which models are fictions (more in Gelfert, 2017).

The researchers (Frigg & Nguyen, 2017) disentangle several questions associated with scientific representation and offer conditions that must be adequately met in any successful answer to these questions. They also review the main contemporary accounts of scientific representation through the lens of these questions; among these there are similarity, isomorphism, inferentiality, and other.

The pedagogical model defines what high quality teaching looks like at any particular level of institutionalised education, which is currently carried out using digital technology as a pedagogical tool. It is not a direct prescription for practice but should clearly describe the suggested model as a unit of a wider educational or pedagogical system. A well-designed model is rather a philosophical approach

equipped with the preferred practical pedagogical solution. Its flexibility toward using a particular theoretical basis or philosophical approach allows for practical modifications, which suit the chosen education settings and learning areas with varied contexts. A model follows, thus, the paradigm or approach, which deepens learning through the learner/researcher continuing endeavours and improves learning/research achievements. As educators' and students' digital skills are developed at different levels of quality, there might be multiple practical modifications within models.

Researcher contribution must cover the nature of pedagogy. Theory and practice of pedagogy is represented by multiple theoretical routes and plurality (disciplines, age and developmental compliance, culture-sensitivity, etc.), its controversial nature shared between science and philosophy, different levels and branches of disciplinarity, a multiplicity of aspects, empirical and theoretical research, historical and epistemological developments, etc. (see more in Žogla, 2017, 101-122). The complex nature of pedagogy is represented by the diversity of pedagogical sciences that include general pedagogy, social pedagogy, and many other sub-branches. Doctoral research should address the theories of general pedagogy alongside with the specific branch to which the investigation is related, as well as define and describe the aspects that are related to the research.

Doctoral students should know that the so-called identity crisis of pedagogy is a normal phenomenon that is characteristic to any of theories, practices, and sciences; investigation of the most topical problems will bring pedagogical theory and practice to re-discover, re-think its own reflexive nature and intentionality. The relationship between theory and practice makes constantly variable pedagogy a science of formal and non-formal (organized) education, in particular theories and processes of educational development.

In recent years, the focus has shifted from individual educator-designed to the team-designed models and modules or even the design of the whole courses of academic/theoretical studies and doctoral research. The shift in the pedagogical approach is based on the doctoral students' digital skills and open access to the web resources, which in the context of other possibilities within the local and global (glocal) environment, alongside the discovery of The Neurosciences allows for remodelling education so that doctoral students are able to take control of their own learning.

They do this by choosing a model of self-directed or independent learning empowered by the possibilities of collaborative, experiential, inquiry-based, problem-based approaches referring to the basic theoretical statements. The web has developed into a universally accessible educational library with well-produced educational resources. However, the doctoral program determines the students' research-based formal learning outcomes and possible individual achievements of student and this allows the educator to assist and, thereby, adapt the chosen pedagogical model as a

deeply conscious background for further self-conducted life-long learning and research.

Transformation deserves particular attention. Digital technologies can enhance and empower doctoral level learning if these are used appropriately. Educator pedagogical assistance should function in a way that helps the doctoral student keep the modes of learning effective at the doctoral level by applying adequate-quality skills; currently the EU countries use the terminology of competencies (OECD, 2005; Council of the European Union, 2006; Ferrari, 2013) - it is important what scope and depth of content is applicable that should be defined and clearly described by doctoral students. Nonetheless, competencies (in other approaches – skills) are the preferred academic outcome and by using all of the resources of the doctoral student, they become his/her individual achievements and powerful tools for further learning and research. Educators should investigate these and suggest the best possible individual learning experiences in cooperation with peers or experienced researchers, preferably in educator-student teams.

Doctoral students, as learners, might not know everything that is desirable and possible to know and everything that they should know, or how to make the knowledge and skills that we have into that which we want to become. Learning from each other, sharing experience, and following educator guidance will help them to achieve their higher ambitions in the most optimal way, in the shortest possible time and with a rational use of energy.

Formal education does things differently from that, which students can do by themselves. As learners, doctoral students have to be engaged in the journey to higher achievements – that learning journey is as hard as it ever was.

"Our education systems could be understood as massive uncoordinated experiments where, every day, every teacher has the opportunity to test and discover new techniques, and learn from their students what works, and what does not" (Laurillard et al., 2018, p. 1045). If this were to happen, it would result in a transformation of teaching into a design science to keep improving its practice, in a principled way, building on the work of others (more in Laurillard, 2012, 2013).

Let us look again at the newly licensed doctoral program in Educational Sciences with pedagogy at its core and try to define its transformational potential by wider usage of digital technology, underpinning on Neurosciences alongside the other theories and approaches, designing team-based classes, etc. This might be a valuable research topic for doctoral students. It is worth remembering that in education there might be a gap between the transformational possibilities of the program/curriculum and its practical implementation:

- Does the program trigger a shift in educator pedagogical thinking?
- What will be the evidences of its implementation?
- What are the real guarantees that the potential will be realised?

- How will the program design trigger a shift in practising the modes of student learning?
- Will inquiry-based learning and integration between the academic and research components of the curriculum emerge, etc.?

We try to find the answers through the lens of the learner, even if the learner is a doctoral student who joins the doctoral program motivated, not only by the possible degree but also, expecting assistance on the way, for instance, in order to investigate more deeply a well-known pedagogical constancy, to create and implement a useful pedagogical model. At the starting point the target might be general and abstract because doctoral students for the first time meet with a doctoral level research, therefore, they might meet one or several difficulties that are rooted in their limited experience. The doctoral student neither knows the details of the content and the research process, nor, how these components could be integrated with each other. Neither does he/she know what transformations would be relevant in learning and teaching with digital technologies, nor how the chosen research problem can be focussed on good research and achieve the appropriate outcome.

These and other questions are topical: what are the appropriate transformations of pedagogy in order for it to be able to initiate and maintain transformations in doctoral learners; how does pedagogy respond to the challenges of changes in digital technology and the dialogue between theory, suggested by university doctoral program, and the wisdom of practice? There are potentially many more questions, which can become the hypothesis of an investigation related to internal constancies of a pedagogical process that are being transformed by incorporating external impacts and further transform the students' and educators' achievements. Measuring transformation is as complicated as pedagogy itself (Istance, et al., 2019).

Doctoral students, as well as educators, focus technological provision and its use on those things which already form a part of their background knowledge, understanding, and skills – the choice of information systems, the experience of data gathering, communication and idea-exchange among researchers, presentation of the findings. Meanwhile, the selection and use of digital technologies appropriate to the doctoral level needs to identify and address truly complex issues that have not yet been investigated. The problem of transformations is yet to be exhausted.

Mindfulness. The role of educator decision-making in the present complicated and rapidly changing times is a common phenomenon in doctoral research and pedagogical practices that should provide a relevant to doctoral studies quality, which does not happen or results in inappropriate decisions if the educator's pedagogical mindfulness is under-developed. Even more, pedagogical mindfulness will be an appropriate quality of those holding Ph.D. in education.

Multiple changes in the social world, triggered by transformations in education, as in all spheres of human life, require a particularly careful and responsible analysis

of the context in which education reforms are subjectively implemented and institutionalised. Educators', managers' and doctoral students' mindfulness seems to be an appropriate concept in this context, when it is necessary to react quickly to influential processes and make the right and wise decision to act.

Mindfulness is a special moment-by-moment awareness that arises through paying attention, on purpose, in the present moment, non-judgmentally, in the service of self-understanding and wisdom (Kabat-Zinn, 2017). When a person practices mindfulness, his/her thoughts tune into what they are sensing in the present moment rather than recalling the past or imagining the future. It is a skill of purposely bringing attention to, and observing, the ongoing stream of internal and external stimuli, such as physical sensations, thoughts, emotions, and environmental stimuli, with an attitude of non-judgmental acceptance. It can be developed through mindfulness exercises, promote the intentional self-regulation of attention, encourage individuals to develop an awareness of cognitive-emotional processes, thereby reducing uncertainty, developing a relationship with their thoughts and feelings (Kabat-Zinn, 2003).

As the quality of consciousness or awareness and understanding of academic activities, learning, and research mindfulness manifests itself nowadays as heightened attention to responsibility, therefore, is worth special consideration. Educators at universities who work in doctoral programs are experienced scholars, hold doctoral degrees and professors' positions, but many of them have degrees in their specific subject areas and may be less experienced in pedagogy.

This situation prompts discussion about whether it is more important for educators to be highly educated in a specific content area rather than in general pedagogy, educational theory, or subject didactics, which together make up the basis for mindfulness and can be viewed as strong pedagogical content knowledge to guide acquiring of the particular science/subject, i.e., (a) deep knowledge of the science, (b) the most effective ways to facilitate doctoral students' academic studies, (c) effectively conduct their investigations to become efficient researchers. Competent teaching/assisting learning or studies is not the same as being knowledgeable in a science.

Thus, the educator's pedagogical mindfulness is a synthesis of the awareness that comes from paying attention to the most important objectives related to the activities of educators (education, developmental, and educative).

Mindfulness adds to mental strength. It can be self-developed as part of an educator's and doctoral student's further or life-long self-education. As a mental state mindfulness can be achieved by focussing one's awareness on the present moment coupled with acknowledging and accepting one's feelings, thoughts, and sensations. Identifying the connection between mindfulness and the competence-based approach might help doctoral students to focus learning on better achievements, systematise knowledge, and achieve knowledgeability.

Researchers (Kladnitski, Smith, Allen, Andrews, & Newby, 2018) have completed a pilot study on transdiagnostic internet-delivered cognitive-behavioural therapies and find mindfulness effective for treating anxiety and depression in adults. The findings show that it is feasible to practice online training. Emotional disorders, in the rapidly changing world, are phenomena that can trigger disabilities in individuals worldwide (Mathers et al., 2006). Being widespread and considering that only a small proportion of people receive treatment of those who need it (Harris et al., 2015), effective and efficient assistance for these disorders must become widely available and affordable through online treatment (Carlbring et al., 2018). Educators will admit that the best way to avoid the above-mentioned complications is to develop individual internal power of resistance.

Similar awareness has been reported by educators and doctoral students who participated in the DocTDL project, especially through discussions during the courses. Integrated and complex interventions have been studied in the project INOSOCTEREHI, which was completed at the Rezekne Academy of Technology in 2015-2017, and it was argued that, in order to be efficient, treatments needed to address cognitive, affective, and behavioural processes implicated in the development and maintenance of physical, emotional, and behavioural balance of learners.

Anyway, mindfulness seems to be a valuable individual quality for educators and young scientists in their journey to achieving the wisdom of a professional and researcher.

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This reviewed article collection has been prepared by the researchers of the project "Implementation of Transformative Digital Learning in Doctoral Program of Pedagogical Science in Latvia" (DocTDLL) lzp-2018/2-0180 (2018-2020) adopted by the Academy of Sciences and Ministry of Education and Science of Latvia. The authors of the chapters have approbated their findings at international conferences, through published articles in issues that are nominated in SCOPUS and WOS, therefore have high international recognition. A program for educator digital enhancement has implemented the idea of transformative digital learning and approbated through courses of educators and doctoral students in 2019 and 2020.

This collection of reviewed articles is not designed in a traditional manner by providing a description of the research; the chapters are focussed on the findings, considerations, and prompted by the research gaps that might be of value for the doctoral investigations and serve as hints for new ideas, as well as identify problems and trigger researcher choice. The aim of a limited by scope project was not to cover all possible problems or describe the findings in detail related to such a vast area as transformative digital learning. The aim of the authors is to identify shift in pedagogy, doctoral study, and research process, as well as publish pedagogical considerations by using the knowledge about transformative digital learning that has already been identified; the authors preferred to facilitate doctoral students' understanding of shifts in pedagogy and trigger their capability to notice new opportunities, identify topical problems in the changing educational environment, and capture possibilities of new knowledge-generation for more effective pedagogical provision. These are presented in different ways: by introducing a theoretical approach, description of case studies and experiences, an invitation to discover pedagogy of the digital age, or simply by fragments from researchers' theoretical contributions.

The collection is intended for doctoral student, scientific advisor, and educator learning and research in partnership.