

DESIGN THINKING: LOGIC OR CREATIVITY

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ABSTRACT

As an EU member state, Latvia has set high-quality education provision as a goal in all education cycles. An innovative project called SCHOOL 2030 (SCHOOL 2030) was launched in Latvia in 2016 and is working to introduce a competency-based approach that would promote a holistic view of school subjects. Within the project, a team of experts is working on a framework and content (methodologies, materials, etc.) for integrated learning, using a competency-based approach in specific sciences organized around seven thematic areas: languages; social and civic education; culture and arts, science, mathematics, technology, health and sport. This study is concerned with a new approach to problem-solving in Technology teacher education applying the design thinking approach as an innovative methodology. The aim of the research was to identify the interpretations of design thinking, the importance of the stages of the design process in the design thinking process and the achievement of the result, as well as the aspects of logic and creativity in design thinking. In the research process, bibliometry was conducted to gain the understanding of design thinking and its connection with logical and creative thinking. A survey as the research method was applied to explore the applicability and importance of design thinking in the study course Design and Technology. The survey questions were related to the understanding of design thinking, the process, its main stages and role in creative activity and development of design products.

The data obtained revealed that the design-thinking approach can be effectively incorporated into the Technology Education field to promote more purposeful problem-solving. Both logic and creativity are present within the application of the design-thinking approach.

Keywords: *Creativity, Design Thinking, Design and Technology, Higher Education, Logic, Stages of Design Process, Teacher Education*

Introduction

Design-thinking approach implementation and research on this issue are gaining more and more popularity. Furthermore, it is being implemented in all the education cycles due to its relevance across many disciplines and within different education cycles. It is worth mentioning that design thinking process is integrated into different scientific and scholarly

disciplines and fields of study. Luka (2014) argues that this approach is both “human-centered and directed towards problem-solving. In addition, it fosters the development of twenty-first century skills and enhances creativity. Therefore, it promotes a capacity for innovation.” She also emphasizes that “design-thinking approach is relevant in future teachers’ education” (Luka, 2014).

The article reports the selected results of the mixed-method research conducted applying the Action Research (ongoing) and survey as the approaches to research design introducing the first stage (cycle) of the research, namely, the survey aimed at identifying the situation related to design-thinking approach implementation and the stakeholders’ awareness of the methodology for implementing the respective approach. The data collection methods within the survey framework included the questionnaire ($n = 50$), the expert interview ($n = 3$), and the focus group discussion. The research sample for the questionnaire survey comprised 50 respondents. The data obtained revealed that, firstly, the approach is gaining the popularity among the professionals in Latvia; secondly, there is still a gap in the research and practice on design-thinking approach implementation in Latvia; thirdly, both the aspects of logic and creativity were acknowledged having the significance in the design-thinking process implementation.

Literature Review (Bibliometric Analysis)

The subchapter introduces the literature review identifying the key research issues and trends within practices of the design-thinking approach implementation. The theoretical literature review led to the identification of the up-to-date scholarly debates within the research scope and the clarification of the theoretical and methodological background for the implementation of the empirical research.

To explore the most topical research directions within the design-thinking approach implementation, the analysis of the sources in the Directory of Open Access Journals launched in 2003 containing over 16 500 peer-reviewed open access journals covering all areas of science, technology, medicine, social sciences, arts and humanities was performed. Bibliographic coupling and co-word analysis was performed based on the following criteria: title, abstract, author keywords, index keywords, full text (Emich et al. (2020)). The sources with the keywords “design-thinking” were selected resulting in retrieving approximately 715 sources. Based on the research scope, the additional keywords “creativity” and “logic” were added revealing the availability of 67 and 5 published sources respectively. The research on design-thinking and creativity was published in the following journals: Sustainability (4); CLEI Electronic Journal (2); Creativity Studies (2); E3S Web of Conferences (2); MATEC Web of Conferences (2);

She Ji: The Journal of Design, Economics and Innovation (2); Systems (2); AIMS Neuroscience (1); Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis (1); Advances in Building Education (1); Agathón (1); Amfiteatru Economic (1); Ardeth (1); Artifact (1); Athens Journal of Business & Economics (1); BMC Medical Education (1); CERN IdeaSquare Journal of Experimental Innovation (1); Comunicar (1); Designs (1); Designs for Learning (1); Disertaciones (1); Frontiers in Psychology (1); Frontiers in Public Health (1); Frontiers of Architectural Research (1); Future Studies Research Journal: Trends and Strategies (1); ITM Web of Conferences (1); Iconarp International Journal of Architecture and Planning (1); InSitu: Revista Científica do Programa de Mestrado Profissional em Projeto, Produção e Gestão do Espaço Urbano (1); International Journal of Industrial Engineering and Production Research (1); International Journal of STEM Education (1); JADECS (Journal of Art, Design, Art Education and Culture Studies) (1); Journal of Architecture, Art & Humanistic Science (1); Journal of Education Culture and Society (1); Journal of Innovation Management (1); Journal of Innovation and Entrepreneurship (1); Journal of Mathematics Education at Teachers College (1); Journal of Medical Education and Curricular Development (1); Journal of Microbiology & Biology Education (1); Journal of Open Innovation: Technology, Market and Complexity (1); Journal of Vasyl Stefanyk Precarpathian National University (1); Knowledge Management & E-Learning: An International Journal (1); Organizacijų Vadyba: Sisteminiai Tyrimai (1); Proceedings (1); RAC: Revista de Administração Contemporânea (1); Raumforschung und Raumordnung (1); Review of Artistic Education (1); Revista Electrónica de Investigación Educativa (1); Revista Gestão e Desenvolvimento (1); Science Education International (1); Temporalités (1); The Journal of Health Design (1); The Southern African Journal of Entrepreneurship and Small Business Management (1); Вісник Університету імені Алфреда Нобелів: Серія Педагогіка і Психологія (1); Westcliff International Journal of Applied Research (1); Архитектон (1); Питання культурології (1); Управление (1); теорія та практика дизайну (1). The research on the design-thinking and logics was published in Etikonomi (1); FORMakademisk (1); Journal of Innovation Management (1); She Ji: The Journal of Design, Economics and Innovation (1); Sustainability (1).

Based on the key words “design-thinking”, 715 indexed articles were found. The sources related to the field of education comprised 108 indexed articles. As concerns the year of publication, the conclusion can be drawn that research on the design-thinking is gaining popularity. For instance, the sources published in 2011-2018 comprise 31 units in total, while the sources published since the year 2019 up to present already comprise 74 units.

Some studies are devoted to the systemic literature review focusing on the analysis of the data obtained in the case studies, reports, theoretical analyses, and other scholarly inquiries to deepen understanding of the goals, objectives, contexts, benefits and drawbacks of design thinking in education (e. g., Panke, 2019). The author focuses on the pedagogical opportunities of design thinking and its application in different subject areas through the analysis of the characteristics of design thinking that make it useful for education; the different education practices it can be applied to; tools, techniques and methods; the limitations or negative effects of design thinking (Ibid.). Kohls (2019) highlights the importance of the application of the design-thinking approach in higher education For instance, Kohls (2019) focuses on the necessity to create hybrid learning spaces with tools that support design thinking. Within the study, the design thinking is defined as “thinking in design” or “thinking with design.” “Creating new forms is a way of thinking and reflecting about both the solution and the problem space” (Kohls, 2019). Jitaru (2019) highlights “the need to develop social and creative abilities that lead students to competence in design thinking. Successful response of the student to the demands of professional and social life requires skills like empathy, assertiveness, cooperation, problem solving, implementation of innovative solutions. Ability of design thinking involves a divergent thinking, ability to autonomously design their own strategies in relation to personal development needs, self-assertion and prosocial project development.” Beligatamulla et al., (2019) explore the educator experience and sense-making of design thinking pedagogy in the higher education context. Design thinking has become a pedagogical phenomenon in higher education due to its widespread relevance across many disciplines. For instance, Beligatamulla et al. (2019) poses the questions on the guiding how educators in higher education make sense of design thinking pedagogy.

Many studies are devoted to case studies, for instance, application of design thinking in vocational schools (Krüger, 2019); design thinking frameworks in health professional education (McLaughlin, et al., 2019). The application of the design-thinking approach is gaining importance within all the education cycles including elementary school (e. g., Paracha, et al., 2019). Zuiker and Jordan (2019) introduce a case study of design thinking in education considering how two educational organizations—a university graduate program and a public zoo—develop and enact design thinking processes in relation to one another.

Many studies emphasize the aspect of creativity within the design-thinking process. Luka (2014) describes it as “the approach that originated in architecture, design and art, and nowadays is applied in many fields. It is in this context that this study describes a design thinking experience aimed

at designing an educational innovation project and uses a questionnaire to analyze 107 college students' perceptions of the process. The results show that the work teams were able to design innovative approaches to real problems they faced, becoming actively engaged in a shared search for solutions. This active methodology boosts students' confidence in their creative capacities and the development of empathic skills."

Research Methodology

Within this research stage, survey as the approach to research design was implemented. The convenience sampling strategy was applied. The research sample comprised 50 respondents affiliated with the social and professional group titled "Design and Technologies". Females represented the majority accounting for 45 respondents ($n = 45$), while males were represented by 5 respondents ($n = 5$). The gender distribution within the survey framework revealed the actual situation in Latvian schools as concerns the dominating position of females within the school environment, which is reiterated in numerous studies devoted to the respective area.

Please indicate your age

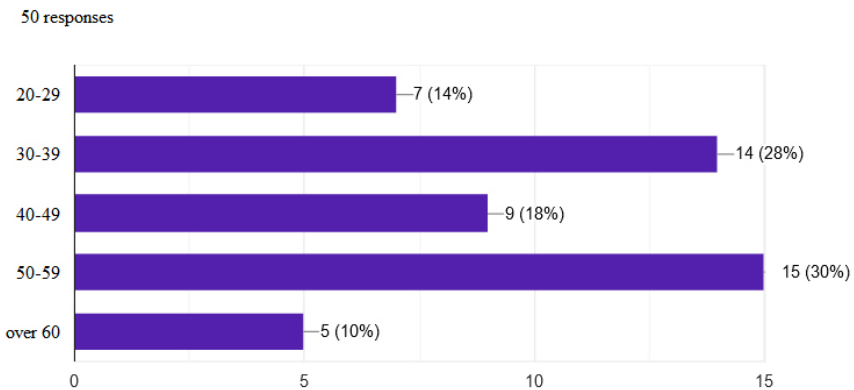


Figure 1. Age of the Respondents

The age of the respondents is summarized within 10 years framework. The majority of the respondents are in the age range of 50–59 years ($n = 15$) or 30%, then 30–39 years ($n = 14$) respondents or 28%, 40–49 years ($n = 9$) or 18%, 20–29 years ($n = 7$) or 14% and over 60 years ($n = 5$) respondents or 10%.

Please indicate your occupation

50 responses

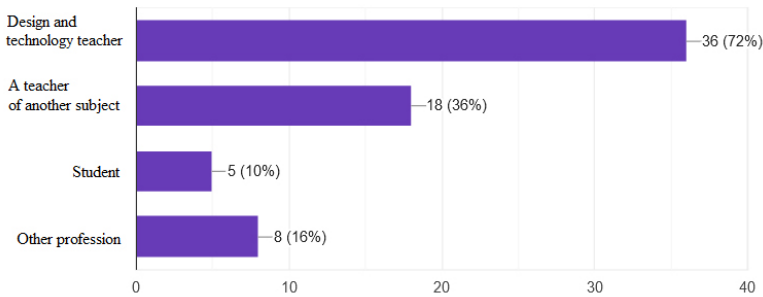


Figure 2. Occupation of the Respondents

As concerns the field of the teaching practice, teachers of the subject “Design and Technology” ($n = 36$) and teachers of other subjects ($n = 18$) mainly participated in the survey. Representatives of other professions were 8 respondents, while 5 respondents represented student population. Provided that in Latvia a teacher may have a qualification in one or more subjects, the teacher may teach another subject at school or be involved in the study process simultaneously with being the in-service teacher. Therefore, the conclusion can be drawn that the Design and Technology teacher has the experience and opportunities to form interdisciplinary links in the acquisition of the curriculum and design thinking is perceived more broadly than within only one subject – Design and Technology.

Summarizing the data obtained for the question: “What is design thinking?”, four categories can be distinguished: 1) design thinking as a way of thinking; 2) design thinking is described as meaningful; 3) design thinking as a process; 4) design thinking as problem solving.

Within the first category, design thinking is distinguished as a way of thinking ($n = 20$), implying both sequential thinking ($n = 5$), creative thinking ($n = 7$) and problem solving ($n = 2$). Problem solving is based on the needs of the environment or people following the stages of the design process. The creative mindset is also seen as crucial in generating ideas and creating design products and solutions that are put into action.

The second category ($n = 17$) is characterized by the term “meaningful”. By meaningfulness the structured and sequential process of design thinking is implied which is implemented in accordance with the steps of the design process, the planning of activities and the achievement of results in the creation of design products or in solving a problem and obtaining results. In addition, the design process is not linear; it can repeat a process step or skip it. Meaning is related to the aspects of sustainability: ecology, economics and viewing things holistically. At school, students understand

the process and the creation of products/solutions that make sense (are meaningful) for learning and the tasks to be performed ($n = 2$).

The third category of design thinking is the process ($n = 9$), as a result of which the desired result can be obtained ($n = 1$), the process in which the idea becomes reality ($n = 2$), the process has the opportunity for collaboration ($n = 1$). It is also the research on the process ($n = 1$). based on the data obtained for this research category, the conclusion can be drawn that the understanding and interpretation of design thinking as a process is very diverse.

The fourth category of design thinking is problem solving, which is mentioned only twice by individual respondents ($n = 2$). Problem solving is discussed more frequently in different combinations ($n = 5$). Problem solving, visual solution, more successful solution ($n = 1$), problem solving in a group ($n = 1$), development of ideas for problem solving ($n = 1$). One respondent interpreted design thinking as a method ($n = 1$) or a tool ($n = 1$) or as a new way of life ($n = 1$). It is challenging to separate categories such as a meaningful process and the end result.

The approach to the formation of design process stages may be different. It is determined by the result to be achieved – a new service, a new product or a new solution to a problem. Dividing the design process into stages makes it transparent and understandable, while different authors can change the design stages, elaborate them or even exclude some stage based on the goal to be achieved.

To better understand design thinking and its process, it is divided into stages. The 3-step process “I-I-I” is simple and understandable, revealing the main stages or steps of design thinking and the results to be achieved. These are *inspiration*, *ideation*, *implementation* (Solovjova, 2017).

In its turn, Skola2030 offers 7 stages of the design thinking process, which promote both the understanding of the design process and the achievement of results and the development of design products or solutions in the subject of design and technology in primary and secondary school. These 7 stages combine both design thinking goals and learning goals and objectives. The seven stages or steps of the process are: 1) identification of needs and opportunities; 2) search for ideas and choice of solution; 3) planning; 4) development; 5) evaluation; 6) testing; 7) implementation (School 2030).

A design product is characterized by its functional or use value and artistic value. The design product must be easy to use and visually in line with the trends and style of the era and fashion.

In order to identify the differences in creating the functional (use value) and artistic value of a design product/solution, the respondents chose 3 process stages out of the 7 stages of the design process and ranked them based on the degree of importance ranging from 1 to 3.

The data obtained revealed that, according to the respondents' viewpoint, in order to create the functional use value of a design product or solution, the most important stages are: 1) identification of needs and opportunities; 2) testing and improvement; 3) development (To create the artistic value, the most crucial stages are: 1) identifying needs and opportunities 2) searching for ideas and choice of solution; 3) development.

Table 1. Stages of the Design Process in Creating Functional or Artistic Value of the Product

Degree of importance	Functional (use value)	Artistic value
1.	identification of needs and opportunities	identification of needs and opportunities
2.	testing and improvement	searching for ideas and choice of solution
3.	development	development

Based on the obtained data, the conclusion can be drawn that the most important step in the development of both a functional and an artistic design product/solution is the awareness of needs and opportunities. The second most important stages are different as concerns both the aspects. In order for a design product to be functional, its testing and improvement is important, while the successful search for ideas and selection of solutions can add artistic value. The third important step in the value creation of both design products is common – development. The second different stage of the design process indicates the difference in the characteristics of the design product and the creation of the most important functional or artistic values. The design value of a design product is acquired during the testing and development phase, but the search for ideas and the choice of a solution are important in the creation of artistic values. The third important stage is the development of the design product and it is common regardless of the value of the design product or solution. Therefore, the conclusion can be drawn that by logically following the stages of the design process or following the design thinking process, both functional and artistic value of the design product can be obtained.

Conclusions

Based on the data obtained within the research framework, the following conclusions can be drawn:

- The design-thinking approach is gaining popularity within all education cycles;

- There is no united interpretation of the design-thinking approach and its implementation;
- Logics and creativity are crucial components within the implementation of the design-thinking approach.
- The design-thinking approach makes up the basis for the meaningful problem solving introducing the steps towards the achievement of the planned result;
- The design-thinking framework provides the innovative solution for the implementation of the study course “Design and Technology”;
- The logics and creativity components should be viewed holistically within the implementation of the approach.
- By logically following the stages of the design process or following the design thinking process, both functional and artistic value of the design product can be obtained.
- Further research should be aimed at the application of the data obtained within the survey framework within the Action Research being implemented as one of the research methods within the mixed-method research methodology.

References

- Beligatamulla, G., Rieger, J., Franz, J. and Strickfaden, M. (2019). Making Pedagogic Sense of Design Thinking in the Higher Education Context. *Open Education Studies*, 1(1), 91–105. <https://doi.org/10.1515/edu-2019-0006>
- Bourgeois-Bougrine, S., Latorre, S., & Mourey, F. (2018). Promoting creative imagination of non-expressed needs: exploring a combined approach to enhance design thinking. *Creativity Studies*, 11(2), 377–394. <https://doi.org/10.3846/cs.2018.7184>
- Duda, A. and Mazur, P. (2020). The Concept of Diploma Thesis Using Design Thinking. *Journal of Vasyl Stefanyk Precarpathian National University*, 7(1), 192–198. <https://doi.org/10.15330/jpnu.7.1>
- Ematinger, R., & Schulze, S. (2012). The crisis is homemade: Why we need a playful approach in teaching and practising strategic preparedness. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis, Mendel University press*, 60(2), 59–68. https://ideas.repec.org/a/mup/actaun/actaun_2012060020059.html
- Faizi, M., Mozaffar F., Khakzand, M. (2007). Conceptual process of design thinking according to contemporary activities. *LJIEPR*, 18(6), 1–8. <http://ijiepr.iust.ac.ir/article-1-155-en.html>
- Fathi, B. (2014). Reflections on architectural design education: The return of rationalism in the studio. *Frontiers of Architectural Research*, 3(4), 424–430. <https://doi.org/10.1016/j.foar.2014.08.004>
- Hernández, C., Duque, E. (2018). Creative Workshop Based on Augmented Reality for the Strengthening of Creativity through the Learning of the Design Thinking Methodology. *Proceedings*, 2(21), 1359. <https://doi.org/10.3390/proceedings2211359>
- Jitaru, O. (2019). Active Learning and Development of Design Thinking Ability at Students. *Review of Artistic Education*, 18(1), 293–299. <https://doi.org/10.2478/rae-2019-0033>

- Kleber, D. M. S. (2018). Design thinking for creating an increased value proposition to improve customer experience. *Etikonomi: Journal Ekonomi*, 17(2), 265–274.
- Koçkan Özyıldız, P., & Yıldız, P. (2020). The infographic model of design thinking process. *International Journal of Architecture and Planning*, 8(1), 282–310. <https://doi.org/10.15320/ICONARP.2020.114>
- Kohls, C. (2019). Hybrid Learning Spaces for Design Thinking. *Open Education Studies*, 1(1), 228–244. <https://doi.org/10.1515/edu-2019-0017>
- Krüger, M. (2019). Design Thinking for German Vocational Schools? Discovering of an Innovative Approach by Testing in Teacher Education. *Open Education Studies*, 1(1), 209–219. <https://doi.org/10.1515/edu-2019-0015>
- Latorre-Coscolluela, C., Vázquez-Toledo, S., Rodríguez-Martínez, A., Liesa-Orús, M. (2020). Design Thinking: Creativity and Critical Thinking in College *Universidad Autónoma de Baja California*. <https://www.doaj.org/article/a4ef1afc729e45a1b1ca101d8f39e231>
- Linton, G., Klinton, M. (2019). University entrepreneurship education: a design thinking approach to learning. *Journal of Innovation and Entrepreneurship*, 8, article no. 3. <https://doi.org/10.1186/s13731-018-0098-z>
- Luka I. (2014). Design Thinking in Pedagogy. *Journal of Education Culture and Society*, No. 2, Vol. 3, Issue 4, 424–430.
- McLaughlin, J. E., Wolcott, M., Hubbard, D. (2019) et al. A qualitative review of the design thinking framework in health professions education. *BMC Med Educ.*, p. 98. <https://doi.org/10.1186/s12909-019-1528-8>
- Oana, J. (2019). Active Learning and Development of Design Thinking Ability at Students. *Review of Artistic Education*, 18(1), 293–299.
- Panke, S. (2019). Design Thinking in Education: Perspectives, Opportunities and Challenges. *Open Education Studies*, 1(1), 281–306. <https://doi.org/10.1515/edu-2019-0022>
- Papageorgiou, K., Hassi, L., Bragos, R., Charosky, G., Leveratto, L., & Ramos, J. (2021). Prototyping the future of learning: reflections after seven iterations of Challenge-Based Innovation (2014–2020). *IdeaSquare Journal of Experimental Innovation*, 5(1), 5–10. <https://doi.org/10.23726/cij.2021.1290>
- Paracha, S., Hall, L., Clawson, K., Mitsche, N. and Jamil, F. (2019). Co-design with Children: Using Participatory Design for Design Thinking and Social and Emotional Learning. *Open Education Studies*, 1(1), 267–280. <https://doi.org/10.1515/edu-2019-0021>
- Park, W., & Lee, H.-K. (2021). Creative integration of design thinking and strategic thinking in a design education framework. *Creativity Studies*, 14(1), 160–174. <https://doi.org/10.3846/cs.2021.13700>
- Prud'homme van Reine, P. (2017). The culture of design thinking for innovation. *Journal of Innovation Management*, 5(2), 56–80.
- Solovjova, J. (2017). Dizaina domāšanas fenomēns [The phenomenon of design thinking]. <https://www.rdmv.lv/lv/news/aktualitates-lv/iesakam/dizaina-domasanas-fenomens>
- Tu, J.-C.; Liu, L.-X.; Wu, K.-Y. (2018). Study on the Learning Effectiveness of Stanford Design Thinking in Integrated Design Education. *Sustainability*, 10, 2649. <https://doi.org/10.3390/su10082649>
- Zuiker, S., Jordan, M. & the Learning Landscapes Team (2019). Inter-Organizational Design Thinking in Education: Joint Work between Learning Sciences Courses and a Zoo Education Program. *Open Education Studies*, 1(1), 1–23. <https://doi.org/10.1515/edu-2019-0001>