

AN EVALUATION OF PERSONALIZED LEARNING BY ONLINE INFORMAL EDUCATION IN CASE OF DESIGN EDUCATION

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ABSTRACT

The advent of digital technology has enabled the development of alternative learning methods that enable personalized education to meet the demands of the modern era. Regardless of geographical location and time, online education facilitates the provision of personalized learning opportunities through asynchronous or synchronous recording. Thanks to Covid-19, the rapid adaptation of formal education to digital environments promoted individualization and self-directed learning. The increasing use of design software in architectural education due to digitalization promotes integrating synchronous or asynchronous extracurricular training into the individual learning process. By exploring the diversity of informal online education programs in design software, this study aims to identify the contributions and limitations of informal learning in personalization. Examining the context of a five-day online workshop and a 21-day course can provide new perspectives through a multidisciplinary environment of discussion and practice, even in a short period of time. These programs provide education and training for skilled designers who have their own unique perspectives and techniques on design. Participants' economic situation regarding course fees introduces a competitive medium, which restricts learning accessibility in any scenario. Moreover, excluding these educational programs from transcripts due to imprecise evaluation conditions results in unfairness. With equal access and fair and accurate evaluation mechanisms, informal online education can help professionals develop unique, global, and harmonious perspectives.

Keywords: Online informal education, personalized learning, design education.

INTRODUCTION

Education and learning involve a continuous interaction between lifelong experiences since infancy and the acquisition of knowledge from structured and semi-structured environments. A structured learning environment consists of systematically organized courses that determine what is taught during the learning process. Higher education institutes organize formal education into a curriculum of compulsory and elective courses, which are maintained through student-teacher interaction with applied and theoretical courses. While adhering to a set framework, any formal education program provides comparable knowledge and awareness (Hager, 2012). Non-formal education has also been integrated into the curriculum through workshops and courses to promote personal development. By contrast, informal education is an observational, experiential form of learning. Expert-led experiences are considered informal learning, while random learning is the experiences gained in everyday life (Table-1, Association for Cultural Relations, et.al., 2019; Grunzke, 2019; United Nations Educational, Scientific and Cultural Organisation, 2011).

Table 1. Learning materials by education classification (Association for Cultural Relations et.al. 2019).

		Education classification			
		Formal	Non-formal	Informal	Random
Compulsory courses					
Optional workshop, courses					
Experiences by observation and practice	With experts				
	Individual				

In addition to the structured or unstructured approach to training, the process also differs depending on the course’s training medium, methodology, resources, and tools. Conventional education involves face-to-face seminars, courses, or exercises that require physical materials to facilitate student-teacher relations (Duff, Gilbert, Kennedy, & Wai Kwong, 2002). Literature sources provide information for instructors using passive oral and written instructional techniques in formal and informal education. Using visual and auditory learning tools such as paper and pencil, pupils participate primarily as listeners in this educational process. Digitalization has personalized and globalized learning through customized media, materials, and methods. Through the use of computers and the Internet, an active, collaborative educational environment is created. (Table 2). Data accessibility and online networks enabled the proliferation of learning methods like online education that provide teaching regardless of time and place. During the Covid-19 pandemic, online learning fulfilled the need for courses and classes in our homes. In addition, distance education encompasses virtual environments in which instructors and students interact indirectly through online videos, text, audio recordings, and educational systems (Moore & Kearsley, 2012).

Table 2. Differentiations between conventional and online education (Wasim, Sharma, Khan, & Siddiqui, 2014; Association for Cultural Relations, et.all. 2019; Dolog, Henze, Nejd, & Sintek, 2004).

	Conventional Education	Online education
Medium	Physical Single media	Virtual Multimedia
Material	Literary, oral presentation,	Video, presentation, audio,
Tools	Pen, paper, chalkboard,	Internet, Applications, Algorithm, Deep Learning
Scale	Isolated/Class	Collaborative/Global
Learning	Teacher based	Student based
	Passive learning	Active learning
		Life-long learning
		Personalized learning

The designs, created with thoughtful observation and inspiration, aim to develop the creativity and discovery potential of the designers’ utopias in the learning domain (Bielefeld & El Khouli, 2021). Design education occurs through active communication in the studio, with constant teacher-student interaction. Digital media don’t just provide social and active informal learning environments but also offer multiple trial-and-error

opportunities to acquire different types of knowledge. Design education, an ongoing learning process of research, production, and experience, has been transformed by digital technology to make production faster and easier. Since the beginning of technological development, informal sharing media have been a part of education. While prior publications have suggested that social, observational, and formal learning methods are necessary to enhance student creativity, the COVID-19 pandemic has shown how design education can thrive in a visual environment (Kolb, 1989; Jankowska & Atlay, 2008; Thoring et.al, 2018). However, the impact of shifting stereotypes in formal education comprises all stakeholders in the learning process. Within this scope, the investigation is chiefly focused on how digitization is introduced into the learning process.

Digitalization in Education

In the aftermath of World War II, countries searched for the creation of safety through technological advancements and personalization in social life, manufacturing, health, and education is also brought by them (Mitchell & McCullough, 1994; Commission of The European Communities, 2001). The reflection of digitalization on education is the digitization of existing publications and drawings and their systemic transformation (Brennen & Kreiss, 2016). By digitizing written documents and making them accessible from both on and off-campus, virtual environments help create online repositories (Carpo, 2013). Numerous universities in England, America, and the Nordic countries have established online archives for their publications and academic resources (Thompson, 2013; Dahlstom & Doracic, 2009). Many public foundations also open their archives to all students and academics in order to adapt to the ever-changing educational environment, similar to that of universities. The education process incorporates visual productions such as videos, photography, and sound recordings with online written resource (Moore & Kearsley, 2012). The usage of this created virtual data is highlighted through websites, online programs, applications, algorithms, software, and artificial intelligence in education. Thus, intelligent learning environments enable students to reach the desired information with the information-tool-human relationship under every condition (Brusilovsky & Peylo, 2003; Hamburg, 2021). Hybrid education, which combines virtual learning environments and information technology with face-to-face education, provides a means of personal knowledge management through emotional exchange between instructors and students (Paker Kahvecioglu, 2007; Wang et.al, 2022).

Digital learning media facilitate the formation of a multi-professional network, enabling collaborative communication to enhance modern professional skills and solve 21st-century problems. To achieve shared global goals, individuals combine their interests and abilities with novel knowledge in a personalized learning environment (Chaichumpa, Wicha, & Temdee, 2021; Kalmar et.al., 2020). Moreover, an experiential environment is established by observing and mimicking nature through mobile applications to comprehend the pedagogical adjustment of students to their interests and competencies. This type of learning defined as ambient learning provides informal and non-formal education and benefits from the Internet (Atif, 2010; Bick, Kummer, Pawlowski, & Veith, 2007; Paraskakis, 2005; Tan, Chen & Yu, 2022).

The internet is a crucial element in shaping the process of personal learning. It enables the development of distance and online education through training courses, certificate programs, and workshops, especially for higher education institutions to access virtual education resources such as videos and pictures (Wasim, Sharma, Khan, & Siddiqui, 2014). Distance education systems began with mobile libraries and were advanced by the educational radio and television channels until the internet's invention at the end of the 20th century (Saba, 2003). Since the early 2000s, online education or web-based learning has been perceived as the educational vision of the future and a powerful tool for lifelong learning. The objectives for 2001 included establishing adequate online education infrastructure in Europe along with standardization and training to enhance trainers' knowledge of the digital world and course content creation (Commission of The European Communities, 2001).

Online education has become a thriving industry in the 21st century thanks to the availability of Internet-enabled applications and websites that facilitate applied learning, international education, and professional skill development (Holon IQ, 2021; Wang et.al, 2022). Web-based learning facilitates improved individual learning performance, shorter graduation times, and customized transcripts in formal education. (Maghsudi, Lan, Xu, & van der Schaar, 2021; Xu, Xing, & van der Schaar, 2016; Klasnja-Milicevic, Vesin, Ivanovic, & Budimac, 2011). Online training consists of recorded (asynchronous) or live (synchronous) instruction. Asynchronous instruction is a form of education in which a particular subject is divided into sections and taught regardless of time or place. Synchronous lectures, however, provide a condensed presentation of a specific topic within a certain amount of time. This educational platform offers synchronous and asynchronous training sessions for technology, software, and algorithms to support professional disciplines in design and planning (Tan, Chen, & Yu, 2022; Roque-Hernandez et al., 2021). Thus, qualified works arise from improved learning environments, while competition occurs among businesses (Kim & Park, 2020). Online informal learning allows individuals to access personalized education anytime and anywhere using various tools and materials during Covid-19.

Online Informal Education in Design Courses with “Personalization”

Design education has always emphasized creating original forms through dynamic instructor-student interaction. The education confidently starts by imparting fundamental design principles for spatial perception, then advances towards intricate multidimensional ventures encompassing diverse architectural disciplines. Architectural education develops students’ creativity and problem-solving skills, enabling them to showcase original and innovative designs through sketching. Digital tools provide designers with an efficient means of expressing their thoughts, facilitating collaboration and rapid iteration. The implementation of this sketching process involves hand drawing before any software can be utilized (Ataman & Lonman, 1996; Gonenc Sorguc, Krusa Yemisoglu, & **Ozgenel**, 2018).

In the context of formal education, algorithms, computer-aided designs, and CNC machines are indispensable tools that enable students to skillfully manage materials, equipment, and time in both design and production (Benabdallah, Bourgault, Peek, & Jacobs, 2021). The advancement of education through algorithm integration is being propelled by the utilization of online courses, data storage software, machine learning, learning management systems, and virtual classes with simulations. The ultimate goal of this approach is to significantly enhance the problem-solving skills of students across diverse disciplines (Dolog, Henze, Nejdil, & Sintek, 2004; Sangineto, 2008; Gelsomini, Leonardi, & Garzotto, 2020).

Incorporating “research by design” into workshops is essential to streamline intricate built environment problems and elevate the caliber of architectural education (Sipahioglu, Abbas, & Yilmaz, 2021). The development of digital design tools, workshops, and courses helps students expand their creativity by considering current paradigms of space, humans, and aesthetics. Informal education confidently instills hand drawing and digital design programs to enhance awareness and perception of urbanization while synchronously promoting competition (Turgut & Canturk, 2015; Polatoglu & Vural, 2012; Akcay Kavakoglu, 2015). Both approaches encourage students’ motivation and self-confidence and keep them in a constant state of learning.

Online courses are comprehensive educational programs that universities and private online education institutions offer. These programs can be taken either synchronously or asynchronously to cater to the needs and preferences of different learners. The current study delved into the realm of design disciplines related to computer technology, with a specific focus on synchronous online courses and workshops. Numerous prestigious universities across the globe provide certificate programs centered on the domains of 2D and 3D design, as well as design thinking, which encompasses the field of AI and deep learning. These programs are readily accessible through popular online learning platforms (Table 3).

Table 3. Synchronous and asynchronous online courses and workshops related to architectural design

Institute	University-Private	Subject	Learning type	Course / Workshop	Resource
Udemy	Private	Plan & Sketch Programs	Asynchronous	Course	https://www.udemy.com/courses/design/?p=3&search-query=design
		Physical Modeling			
Edx	Stanford University	Computational 3D Design	Asynchronous	Course	https://online.stanford.edu/
	The Michigan University	Design Thinking			
Coursera	The University of Melbourne	Algorithmic Design Production	Asynchronous	Course	https://www.coursera.org/search?query=design&
	The University of Melbourne	3D Modeling Design Computing			
Youtube	MODE Lab	Virtual & Augmented & Mixed Reality	Asynchronous	Course	https://www.youtube.com/channel/UCFwIL20fwOmTUKxJgOPk5Jg
Rethinking the Future-RTF	Private	Parametric Design	Asynchronous	Course/ Workshop	https://www.re-thinkingthefuture.com/
Rat-Lab	Private	Design Learning	Synchronous	Workshop	https://www.rat-lab.org/winterschool2020
Black Spectacles	Private	Design Thinking	Asynchronous	Workshop	https://blackspectacles.com/courses/introduction-to-parametric-design-in-grasshopper/
Archistar Academy	Private	Computational Design	Asynchronous	Course	https://academy.archistar.ai/streams/parametric-design
Think Parametric	Private	Modeling	Asynchronous	Course	https://www.thinkparametric.com/
		BIM Visualization			

This research aims to analyze diverse online informal education and highlight their individual and collaborative advantages and limitations in personalized learning through examples that contribute to education design. The inquiry begins with an assessment of the impact of digitalization on the field of education and the progress made in the online learning domain. The second part of this investigation conducts an in-depth analysis of various instances of online non-formal education in design and critically evaluates their respective strengths and limitations. The primary research question of this study is, ‘How does developing personalized education through diversified informal online learning platforms contribute to formal design education?’.

METHOD

In-depth research studies have meticulously analyzed the integration of technology in education and the structure of virtual courses (Cox, 2012; Castro & Tumibay, 2021). Additionally, surveys have diligently evaluated the effects of modified training techniques on students (Song & Bonk, 2016; Tan, 2013). On the other hand, the number of studies published on how the design process trains in virtual medium and the outputs of this learning (Ceylan Dadakoglu, 2022; Park, 2011; Lahti & Seitamaa-Hakkarainen, 2014). In

In addition to published research, the present study assesses how an online workshop and course curriculum, which is part of informal education, helps to design learning in potential opportunities and challenges. The secondary research method as a part of quantitative research through literature review and case studies, is used to assess the situation (Stewart & Kamins, 1993).

The literature review of this study releases in three parts;

1. What is the process of learning and education, how does it diversify and what is the role of informal education in this process?
2. What has been the impact of digitalization on the education and learning process? How has it evolved? What kind of things have been changed by its development? What has been its impact on personalized education?
3. How has digital learning enhanced design education? What is the impact of diverse informal educational media on design education? How has personalized education developed within design education?

In the second phase, which consisted of three steps, the state of informal education in design learning was studied by sampling. Two forms of informal education, workshops, and digital design courses, are selected in the first step, while the sampling parameters are decided in the second. In this study, the sample selection was based on the duration of the training, with the focus solely on the possibilities of digital training in terms of time use. Furthermore, computational design has been selected as the subject of this study due to its widespread use as a design approach in both educational and professional contexts. According to the similarities and differences, the samples were evaluated for their learning outcomes using a synchronous teaching system, reciprocal thinking, discussions, and assessment methods. Their contributions to formal design education were demonstrated apparent through analysis of their syllabus, which included theoretical or practical training methods, as with the resources provided to students after the program (Figure 1).

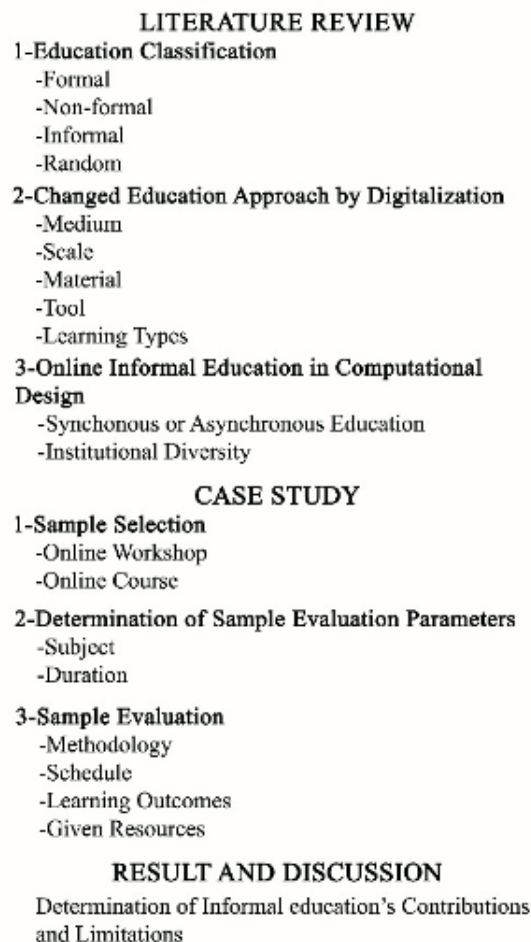


Figure 1. Methodological flow

Data Collection and Analysis

As design becomes digitized, the ability to adapt and change is enhanced, allowing for rapid production across a network of digital links. In addition to the aesthetic considerations of design, the solutions for environmental issues highlight the growing significance of rapid production and encourage designers to think algorithmically. Meanwhile, various design approaches have evolved, such as computer-aided design (CAD), computer-aided modeling (CAM), design computation, computational design, and parametric design (Oxman, 2006).

Digital design tools are increasingly used alongside traditional teaching methods in design education due to changing digital learning mediums, methodology, and materials. As computer-based design courses increase in curricula, design projects are also conducted through digital media. The utilization of design programs by students to create quicker and more variable designs lead to an intense learning interest in different software and a growing competitive environment. In this context, there is an ever-growing demand for extracurricular training options to diversify education and accelerate learning. Short-term training, such as courses, certificate programs, and workshops, allows students to adjust to the evolving digital landscape and shifting production techniques. Workshops, courses, and certificate programs are delivered synchronously in person and are also virtually conducted. Asynchronous and synchronous courses, certificates, and workshops in computational-parametric design have emerged the significance of computer-, algorithm-, or computation-based design in architectural education. In this context, universities or private institutions offer informal education at the initial, intermediate, and advanced levels. Some occur regarding the instruction of specialized contexts and software plugins.

The study analyzed the online workshop “Introduction to Computational Design” held by Driven by Volumes (2021) and the online course “Sustainability through Computational Design” organized by Rethinking the Future (2021) as instances of informal education, assessing their structural and cognitive components. A systematic identification process was created to uncover reliable similarities and differences in outcomes. Several key factors, such as participant preferences, duration of training, and resources required, determine the scope of the investigation process. Also, the potential learning outcomes are estimated based on their objectives and the methods used by instructors (Table 4).

Table 4. Online Workshop and Course samples about architectural design education (Driven by Volumes, 2021; Rethinking the Future, 2021).

	Course	Workshop
Name	Sustainability through Computational Design	Introduction to Computational Design
Type	Synchronous	Synchronous
Participations	Student Professional	Student Professional
Duration	21 day Each section:120 min	5 day Each section: 240 min
Aim	To teach algorithmically thinking by understanding weather data and performing environmental analysis	To establish parametric design methodology by rethinking existing buildings and implementing new structures.
Methodology	1-Lecture 2-Demonstrations 3-Assignments 4-Group activity 5-Discussions	1-Lecture 2-Practices 3-Question & Answer 4-Discussions
Resources	Understanding of Basic Building Science Climate Data and Environmental Factors Algorithmic Thinking by Grasshopper Simulated and analysis of LEED, GRIHA, IGBC necessities	Computational design interface (Grasshopper, Rhinoceros) Data manipulation Patterns & Attractors Modelling + Meshes

1.Section	Introduction to the Course		Introduction: Rhinoceros + Course overview
	Intro to Rhino		Break
2.Section	Assignment 1	1.Day	Introduction: Grassopper
	Intro to Grasshopper		Geometry Manipulation I
	Assignment 2		Exercise + Q/A
	Intro to EPW		Geometry Manipulation II-III
3.Section	Working with Weather Data		Data Manipulation I-II
	Assignment 3		Exercise
	Comfort		Break
4.Section	UTCI Analysis	2.Day	Data Manipulation II
	Assignment 4		Geometry Manipulation IV
	Sunpath Analysis		Exercise + Q/A
5.Section	Shadow Analysis		Display I
	Assignment 5		Data Association I
			Fields
			Data Association II
6.Section	Shading Mast	3.Day	Break
	Assignment 6		Data Manipulation III
			Data Association III
			Exercise + Q/A
7.Section	Radiation Analysis		Data Management IO
	Assignment 7		Computation
			Meshes
			Break
8.Section	Capstone Project: Discussion	4.Day	Catenary - Kangaroo
			Interactive & Dynamic modelling
			Conclusion + Discussion
9.Section	Jury presentation		Utilities + tips + common errors
			Introduction to loop
			Iterative modeling
			Break
10.Section	Lecture and Demo	5.Day	Iterative modeling
			Iterative modeling
			Conclusion + Discussion

FINDINGS

Workshop programs that offer individual development through environments, materials, and tools also provide an active, person-centric learning process where individuals have the opportunity to learn by doing and gain a multidimensional and interdisciplinary perspective alongside their peers through collective thinking and discussion (Sipahioglu, Abbas, & Yilmaz, 2021). Although online workshops involve one-to-one interaction, they also involve face-to-face interaction in a virtual environment. Online workshops deliver assignments via email and share their outputs in synchronous virtual meetings on social media (Davies, Seaton, Tonooka, & White, 2021). Workshops can provide fundamental knowledge alongside specialized content for specific fields using a range of topics and methods. Especially with the updated software plugins, the range of educational options is expanding.

Parametric thinking teaches designing through algorithms, except formal design education outputs. Especially with algorithms that enable planning and consideration of multiple variables in the digital environment, the

educational process is facilitated compared to traditional design educational materials. While the concept of production incorporating social, environmental, and aesthetic values is consistently conveyed to students, the intellectual creations of designers are readily embodied in the digital design process with rapid adaptation to shifting conditions. Online workshops accelerate the acquisition of tools necessary for transferring design ideas. With this learning, participants can acquire fundamental skills for applying software to create designs. Later, through independent learning of software plugins, designers are able to tackle the design problem from different perspectives and diversify their representation.

This study examines an online workshop that assesses the teaching of parametric design through the practical use of Rhino and Grasshopper software. The program, which aims to transfer intensive foundational information in person, is conducted over five days, with four hours of training per day. Starting with at least 10 participants from various disciplines, students and experts will participate. In this program, a discussion environment is created through questions and answers. While the synchronous nature of this workshop is advantageous for its hands-on and interactive learning approach, it becomes unavailable to individuals with limited financial capacity, except for recorded Rhino and Grasshopper tutorials. The presence of a debate environment provides an objective evaluation of learning outcomes while allowing individuals to gain multiple perspectives from different disciplines. On the other hand, the online program also promotes customization in professional and public life through the visual exchange of opinions. The absence of personal interaction and a promoter learning environment hinders some individuals who require face-to-face communication and a physical presence for optimal education, thereby restricting learning opportunities. Providing brief breaks maintains focus and simplifies cognitive learning for participants. Besides, it also provides the elimination of technical issues such as internet connectivity problems, sound problems, and visual disconnections. For this workshop, participants prepared by acquiring materials (Grasshopper and Rhino software) and tools (computer and reliable internet connection) instead of relying on the traditional workshop approach organized by the committee.

Plugins developed in design software allow concise, speedy, meticulous, and issue-specific solution proposals. After acquiring fundamental knowledge and skills, this training enables individuals to produce more diverse, efficient, and expedient products within their profession. The course program Sustainability through Computational Design, prepared by Rethinking the Future, seeks to integrate building physiology, environmental data, and computational design in design education. The course program offers a collaborative forum for examining global environmental concerns concerning the built environment, utilizing Rhino and Grasshopper plugins. The training program focuses on enhancing the quality of the built environment by integrating climate data into its design. In the construction process, the contribution of software programs is also conveyed in the design process, considering the appropriate conditions for LEED and GRIHA certificates. The growth of environmental consciousness emerges innovation in education programs that focus on teaching methods and subjects related to creating environmentally friendly architectural and landscaping designs. The program alters the concept of personalized design and aids self-confidence and self-expression in practice and presentation.

The proposed program executes with a maximum of 25 participants, whether students or professionals from various disciplines, for 21 consecutive days, with 2 hours of daily work. Its schedule is more extensive than a workshop and incorporates a long-term plan. However, because of the private subject in training, designers or students who regard the built environment have a higher potential to participate. It establishes a collaborative setting that endorses the conception of working together with a teaching methodology centered on practice and discussion. While conveying basic information about plugins through course materials and instructions, participants are prompted to actively engage through practical assignments at the end of each course. Due to the long-term orientation of learning, the points of confusion about the subject matter clarify more easily. In the context of the course, producing a model project and presenting it in front of the jury qualifies the training for its purpose. In addition, this educational platform provides a network of sharing ideas and collaboration between students and professionals for internship or job prospects. Moreover, the training certificates can be beneficial in persuading the business community. Although informal education, not included in the mandatory education system, distinguishes individuals from others in both their learned design program and the environment they have acquired. Participants in this training demonstrate their awareness of current environmental concerns and their ability to engage in individual and collaborative practices to address these challenges.

Digitization in design recognizes new learning opportunities explored in virtual media, according to the online workshop and course examples. This training teaches how to quickly produce designs using digital networks by considering their social, environmental, and aesthetic values. However, digital design fails to promote socio-cultural values like preserving collective memory, culture, and loyalty to a place. According to mandatory schooling, non-formal programs offer efficient communication of intricate details and swift access to necessary design elements. Thus, it develops better-prepared and more efficient personnel for the sector's needs. The informal learning programs facilitate thorough, straightforward, and rapid analysis of the environment, leading to convenient decision-making based on derived conclusions. If the design that develops through the analysis and discussion of information evaluate as a practical medium, younger designers and professionals encourage to think critically. With an active discussion environment, the programs provide indistinguishably gaining permanent achievements than a formal course. Social and occupational information sharing with the multi-disciplinary medium improves also the reassessing occasions to program outputs. However, the training and learning loop sustains wherever permanent materials and products through visual accessibility in online systems and preserves the right to education by hireless open access. While the collaborative and sharing structure required by contemporary design is available in the digital sphere, individuals concurrently construct private educational environments within informal education. The individual's information demands are satisfied by the educational materials and the application process by the participant. The level of interaction between the trainer and the individual can be as much as the capabilities of the virtual environment allow. While these trainings educate more qualified designers, they cause more lonely and selfish individuals to exist in their lives.

Even though the observed samples in this study are unpaid, the capacity to attend education is limited due to the trainer's initiative. In-person training requires a quota limit to manage one-on-one interactions with participants. The rise in participant numbers necessitates individuals to seek solutions to any challenges. Under normal circumstances, online programs facilitate quicker and more efficient instructor interventions in any issues that may arise. However, although online training expands the capacity limit, the maximum participation is still restricted according to asynchronous training. While this generates a competitive environment between students and professionals, it fosters individualization in the profession. In addition, the presence of paid training inhibits the formation of an inclusive learning environment. The differentiation between reaching conditions and learning resources requires a reevaluation of the approach of "universal education accessibility". At this phase, factors such as variations in individuals' ability to create a conducive learning environment, participation capacity, and accessibility to education owing to economic disparities represent the limitations of informal education.

Considering the variety of materials, methodologies, evaluations, and outcomes in synchronous and asynchronous online education, personalization is an inevitable conclusion in learning. The requirements, practices, and evaluation conditions of each training are unique to its owner. While workshops typically involve the sharing of information, discussion, and summary output in a short period, lectures determine complex outcomes with detailed information and evaluation methods for those findings. In both learning, the methods employed by the instructor and the teaching materials set the stage for the process. Therefore, each education and training program is distinctive, and participants who complete such programs distinguish individuals in the business world. These training programs, which explore design disciplines, offer young designers and professionals the chance to develop contemporary and innovative designs.

While workshops and courses enhance the skills of design professionals, they are excluded from transcripts. As well as restricting involvement in non-formal education, any improvements are still unavailable to enhance mandatory education. The absence of informal education in formal education is predominantly due to the existing distinct structures of each system. Structural uniqueness influenced by the standard of learning achievements and outputs (certificates and products) is based on the evaluation parameters and promotes informality in formal education. In this context, a workshop and course require a comprehensive structure and specific titles to be incorporated into formal education. The display of achieved certificates in the transcript provides information about a designer's qualifications in professional life. Even if this engagement activates the competitive and classifying environment, it enhances the multidimensional approach of the design field regarding personal, social, and global factors (Table 5).

Table 5. Limitations and advantages of online workshops and courses to design education

Advantages	Limitations
Shortten term & Applied-based	Individual material
Complex knowledge bundle	Triggering the competitive medium
Multi-disciplinary	Differences in education approaches
Discussion environment	Unequal certificates
Open-access	Lack of involvement in formal education
Virtual accessibility	Resource accessibility

While workshops and courses present valuable sources to advance design information, their integration with higher education institutes should affiliate with the current education system. When informal programs can be incorporated into formal education, personalized learning will become increasingly prevalent among managers, professionals, educators, and students.

CONCLUSION

While digitalization has transformed the education sector, it has also brought personalization to teaching methods. Visual media triggers physical and cognitive personalization through thinking, discussing, and creative processes. The invention of the Internet has facilitated online and distance education, allowing for synchronous and asynchronous programs to be incorporated into the curriculum. Synchronous informal education that has evolved rapidly since the COVID-19 pandemic heavily triggered personalized learning.

The proliferation of digital design in academia and the professions has promoted the growth of synchronous and asynchronous online informal education outside of curricula. Digital workshops and educational programs provide individuals with focused and practical design training, enabling them to acquire vital knowledge and skills in their field. The interactive learning environment that allows for collaboration, coupled with internet access, provides synchronous training that is preferable to asynchronous training. Online education allows individuals to design their own learning environments, promoting personalization. In addition to the isolation of individuals, online programs are a controversial method of education due to the collaborative, effective, and efficient continuum of communication on the visual screen.

Volunteer-driven, synchronous training unfolds within the economic and social realities of individuals. Limited accessibility creates a contradiction regarding the right to education and its inclusiveness. Personalized knowledge development through online education creates a competitive educational and professional atmosphere. In addition, the course administration methods, materials, assessment, and variety of certificates bring personalization. The absence of certificates within compulsory education impedes the growth and development of informal education. Furthermore, the lack of them in transcripts requires additional effort on the part of the individual to communicate their accomplishments effectively. Informal education programs, which serve as a technique and component of the learning process, are progressively integrating into the conventional education model. The acquisition and application of knowledge are essential components of effective design. The depth of understanding required stems from individual perspectives, experiences, and accumulated expertise. Therefore, informal training that offers personalization is an essential parameter in the emergence of original products in design education.

As a result, the provision of informal education online offers distinct frameworks for personalized learning and concurrently intensifies competitiveness within the education sector. Furthermore, it fosters a perception of collaboration by promoting teamwork, facilitates meaningful discussions, offers convenient access to information, and reinforces compulsory education.

Limitation

Within the scope of the study, the influences of informal learning types that provide personalization were assessed theoretically by observing diverse organizations. The fact that each organization and trainer's approach varies in the training, process, and evaluation bound the objectivity of informal education. These learning types can implement over students and professionals by instructors as experimental-control groups. Observed quantitative results reveal providing an objective perspective on informal design learning.

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REFERENCES

- Akcay Kavakoglu, A. (2015). *Repositioning Moving Image in Computational Design Education*. Ankara, Turkey: School of Natural and Applied Sciences of METU.
- Association for Cultural Relations, Georgian Associations for Cultural Politiques, Georgian Associations for Cultural Relations, IRCP, Institut des Relations Culturelles et Politiques, ICRP, Budapest, & Turkish Society for Cultural Relations. (2019). *Through non-formal to digital - Education in the age*.
- Ataman, O., & Lonman, B. (1996). *Introduction to Concept and Form in Architecture: An Experimental Design Studio Using in Digital Media*. In P. McIntosh & F. Ozel (Eds.), *Design Computation: Collaboration, Reasoning, Pedagogy (ACADIA 96)*, (pp. 3-9). Arizona: Tucson.
- Atif, Y. (2010). *Digital Design Learning Patterns in Ambient Learning Environments*. 10th IEEE International Conference on Advanced Learning Technologies, (pp. 229-230). Sousse, Tunisia. doi:10.1109/ICALT.2010.70.
- Benabdallah, G., Bourgault, S., Peek, N., & Jacobs, J. (2021). *Remote Learner, Home Makers: How Digital Fabrication Was Taught Online During a Pandemic*. CHI Conference on Human Factors in Computing Systems (CHI '21), May 8–13, 2021, Yokohama, Japan. New York, USA: ACM. doi:<https://doi.org/10.1145/3411764.3445450>.
- Bick, M., Kummer, T., Pawlowski, J. M., & Veith, P. (2007). *Standards for Ambient Learning Environment*. MMS 2007: Mobilitat und mobile Informationssysteme, 2nd Conference of GI-Fachgruppe MMS, (pp. 103-114). Aachen, Germany.

- Bielefeld, B., & El Khouli, S. (2021). *Adim Adim Tasarim Fikirleri* (12 b.). (V. Atmaca, Cev.) Istanbul: YEM Yayin.
- Brennen, J. S., & Kreiss, D. (2016). *Digitalization*. In *The International Encyclopedia of Communication Theory and Philosophy*. (pp. 1-11). Wiley Online Library.
- Brusilovsky, P., & Peylo, C. (2003). Adaptive and Intelligent Web-based Educational Systems. *International Journal of Artificial Intelligence in Education*, 13, 156-169.
- Carpo, M. (2013). Introduction: Twenty Years of Digital Design. In M. Carpo (Ed.), *Digital Turn in Architecture* (pp. 8-14). Wiley & Sons Publishing.
- Castro, M., & Tumibay, G. (2021). A literature review: efficacy of online learning courses for higher education institution using meta-analysis. *Education and Information Technologies*, 26, 1367-1385. doi:<https://doi.org/10.1007/s10639-019-10027-z>
- Ceylan Dadakoglu, S. (2022). Second Life in Art and Design from Students' Perspective: A Case Study. *Turkish Online Journal of Distance Education-TOJDE*, 23(2), 169-201.
- Commission of The European Communities. (2001). *The e-Learning Action Plan: Designing's Tomorrow Education*. Final, Brussels.
- Cox, M. J. (2012). Formal and informal learning with IT: research challenges and issues for e-learning. *Journal of Computer Assisted Learning*, 1-21. doi:doi: 10.1111/j.1365-2729.2012.00483.x
- Dahlstrom, M., & Doracic, A. (2009, March/April). Digitization Education: Courses Taken and Lessons Learned. *D-Lib Magazine*, 15(3/4), 1082-9873.
- Davies, A., Seaton, A., Tonooka, C., & White, J. (2021). Covid-19, online workshops and the future of intellectual exchange. *Rethinking History*, 25(2), 224-241. doi:10.1080/13642529.2021.1934290.
- Dolog, P., Henze, N., Nejdil, W., & Sintek, M. (2004, May). Personalization in Distributed e-Learning Environments. *Proceedings of the 13th International World Wide Web Conference*, (pp. 170-179). New York. Retrieved from <https://dl.acm.org/doi/10.1145/1013367.1013395>
- Driven by Volumes. (2021). Retrieved from http://drivenbyvolumes.io/introduction-to-computational-design-2nd-edition/?fbclid=IwAR1C9geZN0vnJrEl1SADHeFDx_XC_YTyp3dGallUgwnzZlbiUqAl3Ftg-kM
- Duff, T., Gilbert, I., Kennedy, D., & Wai Kwong, P. (2002). Comparing distance education and conventional education: observations from a comparative study of post-registration nurses. *ALT-J*, 10(1), 70-82.
- Gelsomini, M., Leonardi, G., & Garzotto, F. (2020). Embodies Learnig in Immersive Smart Spaces. *CHI '20: Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems*, (pp. 1-14). Honolulu HI USA. doi:<https://doi.org/10.1145/3313831.3376667>.
- Gonenc Sorguc, A., Krusa Yemisoglu, M., & Ozgenel, C. (2018). Multiverse of Form: Snowflake to Shelder. *36th eCAADe Annual Conference*, 2, pp. 411-416. Lodz.
- Grunzke, A. (2019). The History of Nonformal and Informal Education. (J. L. Rury, & E. H. Tamur, Eds.) Retrieved 06 16, 2021, from *Oxford Handbook Online-Scholarly Research Reviews*: https://www.oxfordhandbooks.com/view/10.1093/oxfordhb/9780199340033.001.0001/oxfordhb-9780199340033-e-32?gclid=CjwKCAjwwqaGBhBKEiwAMk-FtBKArNsJNdPcei25WVEU1_0tvUAjTmeJ2zY6cbia3Fx8o-Ig3MwnjBoCORMQAvD_BwE
- Hager, P. J. (2012). Formal Learning. (N. M. Seel, Editor, & SpringerLink) doi: https://doi.org/10.1007/978-1-4419-1428-6_160.
- Hamburg, I. (2021), COVID-19 as a catalyst for digital lifelong learning and reskilling, *Advances in Research*, 21(1), 21-27, 10.9734/air/2021/v22i130282
- Jankowska M. & Atlay, M. (2008), Use of creative space in enhancing students' engagement, *Innovations in Education and Teaching International*, 45 (3) (2008), pp. 271-279, 10.1080/14703290802176162.

- Kalmar, E., Aarts, T., Bosman, E., Ford, C., de Kluijver, L., Beets, J., . . . van der Sanden, M. (2022). The Covid-19 paradox of online collaborative education: when you cannot physically meet, you need more social interactions. *Heliyon*, 8(1). doi:<https://doi.org/10.1016/j.heliyon.2022.e08823>
- Klasanja-Milicevic, A., Vesin, B., Ivanovic, M., & Budimac, Z. (2011, April). E-Learning personalization based on hybrid recommendation strategy and learning style identification. *Computers & Education*, 56(3), 885-899. Retrieved from <https://doi.org/10.1016/j.compedu.2010.11.001>.
- Kolb, D.A. (1984). *Experiential learning: Experience as the source of learning and development*, Prentice-Hall, Englewood Cliffs, N.J.
- Lahti, H., & Seitamaa-Hakkarainen, P. (2014). Designing teaching-teaching designing: Teacher's guidance in a virtual design studio. *Journal of Learning Design*, 7(1), 10-26. doi:10.5204/jld.v7i1.140
- Maghsudi, S., Lan, A., Xu, J., & van der Schaar, M. (2021). Personalized Education in the Artificial Intelligence Era: What to expect now. *IEEE Signal Processing Magazine*, 38, 37-50.
- Mitchell, W. J., & McCullough, M. (1994). *The Second Industrial Revolution*. In *Digital Design Media* (2. ed.). Wiley & Sons Publishing.
- Moore, M., & Kearsley, G. (2012). *Distance Education: A Systems View of Online Learning* (3. Edition). Canada: Wadsworth, Cengage Learning. Retrieved from https://books.google.com.tr/books/about/Distance_Education_A_Systems_View_of_Onl.html?id=dU8KAAAAQBAJ&printsec=frontcover&source=kp_read_button&redir_esc=y#v=onepage&q&f=false
- Paker Kahvecioglu, N. (2007). Architectural design studio organization and creativity. *ITU AIZ*, 4(2), 6-26.
- Paraskakis, I. (2005). Ambient Learning: a new paradigm for e-learning. *The 3rd International Conference on Multimedia and Information & Communication Technologies in Education (m-ICTE2005)*, (pp. 26-30). Spain.
- Park, J. (2011). Design Education Online: Learning Delivery and Evaluation. *International Journal of Art & Design Education*, 30(2), 176-187. doi:10.1111/j.1476-8070.2011.01689.x
- Polatoglu, C., & Vural, S. M. (2012). As an educational tool the importance of informal studies/studios in architectural design education; case of Walking Istanbul 1&2. *Procedia-Social and Behavioral Sciences*, 47, 480-484.
- Rethinking the Future. (2021). Retrieved from <https://www.re-thinkingthefuture.com/sustainability-through-computational-design/>
- Roque-Hernandez, R. V., Diaz-Roldan, J. L., Lopez-Mendoza, A. & Salazar-Hernandez, R. (2021), Instructor presence, interactive tools, student engagement, and satisfaction in online education during the COVID-19 Mexican lockdown. *Interactive Learning Environments*, <https://doi.org/10.1080/10494820.2021.1912112>
- Saba, F. (2003). Distance Education Theory, Methodology, and Epistemology: A Pragmatic Paradigm. In M. G. Moore, & W. Anderson (Eds.), *Handbook of Distance Education* (pp. 3-20). New Jersey: Lawrence Erlbaum Associates.
- Sanginetto, E. (2008). An Adaptive E-Learning Platform for Personalized Course Generation. In *Architecture Solutions for E-Learning Systems*. doi:10.4018/978-1-59904-633-4.ch014.
- Sipahioglu, I., Abbas, G., & Yilmaz, B. (2021). Outside the school: A review of the non-formal short-term architectural workshops. *Journal of Design for Resilience in Architecture & Planning*, 2(1), 44-63. DOI: 10.47818/DRArch.2021.v2i1011.
- Song, D., & Bonk, C. J. (2016). Motivational factors in self-directed informal learning from online learning resources. *Cogent Education*, 3(1). doi:<https://doi.org/10.1080/2331186X.2016.1205838>
- Stewart, D., & Kamins, M. (1993). *Secondary research: information sources and methods* (2nd b.). USA: Sage Publication.

- Tan, X., Chen, P. & Yu, H. (2022). Potential Conditions for Linking Teacher's Online Informal Learning with Innovative Teaching, Thinking Skills and Creativity, 45, Article No: 1010122. <https://doi.org/10.1016/j.tsc.2022.101022>
- Tan, E. (2013). Informal learning on Youtube: exploring digital literacy in independent online learning. *Learning, Media and Technology*, 38(4), 463-477. doi:<https://doi.org/10.1080/17439884.2013.783594>.
- Thompson, J. B. (2013). *Books in the Digital Age: The Transformation of Academic and Higher Education Publishing in Britain and the United States*. John Wiley & Sons. Retrieved from <https://books.google.com.tr/books?id=UZisAQAAQBAJ&dq=%C4%B1mpact+of+digitalization+in+education&lr=>
- Thoring, K., Desmet, P. & Badke-Schau, P. (2018), Creative environments for design education and practice: A typology of creative spaces, *Design Studies*, 56, 54-83, <https://doi.org/10.1016/j.destud.2018.02.001>.
- Turgut, H., & Canturk, E. (2015). Design Workshops as a Tool for Informal Architectural Education. *Open House International*, 40(2), 88-95.
- United Nations Educational, Scientific and Cultural Organisation. (2011). *International Standard Classification of Education-ISCED*. Canada: UNESCO Institute for Statistics.
- Wang, Y., Cao, Y., Gong, S., Wang, Z., Li, N. & Ai, L. (2022). Interaction and learning engagement in online learning: The mediating roles of online learning self-efficacy and academic emotions. *Learning and Individual Differences*, 94, 102128, <https://doi.org/10.1016/j.lindif.2022.102128>
- Wasim, J., Sharma, S., Khan, I., & Siddiqui, D. (2014). Web Based Learning. *International Journal of Computer Science and Information Technologies (IJCSIT)*, 5(1), 446-449.
- Xu, J., Xing, T., & van der Schaar, M. (2016, October 15). Personalized Course Sequence Recommendations. *IEEE Transactions on Signal Processing*, 64(20), 5340-5352.