CURRENT STUDIES IN

EDUCATIONAL AND SOCIAL SCIENCES

Editor

Osman ÇARDAK

ISRES Publishing

Current Studies in Educational and Social Sciences

Editor

Osman ÇARDAK

Cover Design and Layout

Enes Malik YALÇIN

Current Studies in Educational and Social Sciences

Published by ISRES Publishing, International Society for Research in Education and Science (ISRES)

Includes bibliographical references and index

ISBN:

978-625-6959-98-9

Date of Issue:

December / 2025

Address:

Askan Mah. Akinbey Sok. No:5/A Meram/Konya/Türkiye

E-mail:

isrespublishing@gmail.com

www.isres.org

PREFACE

Current Studies in Social Sciences brings together contemporary and interdisciplinary work that addresses some of the most pressing educational and social issues of our time. The volume is structured in two main sections—Educational Sciences and Social Sciences—and offers readers both solid theoretical foundations and practice-oriented insights that bridge research and real-world challenges.

The first section, "Educational Sciences" (Articles 1–7), focuses on the transformation of education in the face of environmental, technological, cognitive, and socio-cultural change. The opening chapter on the place of media in environmental education and eco-media literacy explores how media can become a powerful tool for fostering environmental awareness and critical ecological consciousness. The following study on digitalization in education and its adverse effect, digital obesity, problematizes the excessive and uncritical use of digital tools, drawing attention to the risks that accompany technology-rich learning environments.

A different but complementary perspective is offered in the chapter examining individual differences in learning mathematics through thinking styles, which situates achievement in mathematics within the broader context of cognitive diversity. The discussion of school gardens as out-of-school learning environments for science education highlights how authentic, nature-based spaces can enrich students' scientific inquiry and environmental responsibility. The chapter on reimagining engineering education critically revisits the pedagogical foundations of the field and outlines possible future directions for more human-centered and socially responsive engineering training. This section further includes a bibliometric analysis of global research trends in values education (2004–2025), mapping how values have been conceptualized and studied across different contexts, and concludes with a contribution on the winds of change in science higher education, which examines emerging approaches designed to enhance learning outcomes in university-level science programs.

The second section, "Social Sciences" (Articles 8–11), broadens the lens to encompass methodological, psychological, migratory, cultural, and architectural dimensions of social life. The chapter on the use of focus groups in social research offers a nuanced methodological discussion of the potentials and limitations of this widely used qualitative technique. This is followed by a timely contribution on mental health and migration, which addresses the psychosocial challenges experienced by African migrants in Canada and underscores the importance of culturally sensitive mental health support.

Shifting towards cultural history and heritage, the study of the architectural magnificence and artistic decoration of the Sultan Hassan Mosque–Madrasa in Mamluk Cairo provides an in-depth look at how built environments reflect religious, political, and aesthetic values. The section closes with a chapter on the impact of screen use on the mental health of children and adolescents, engaging with one of the most critical contemporary concerns for families, educators, and policymakers in an increasingly digitalized world.

We extend our sincere gratitude to all the authors and contributors for their scholarly efforts, and to the editorial team for their meticulous work in bringing this volume to completion. We believe that this book will serve as a valuable resource for researchers, students, academics, and policymakers who seek to understand and respond to the evolving dynamics of education and society.

We hope that the studies presented here will inspire further research, dialogue, and collaboration across disciplines, and that readers will find this volume both intellectually enriching and thought-provoking.

December - 2025

Editor

Dr. Osman ÇARDAK

Necmettin Erbakan University, Türkiye

ocardak@erbakan.edu.tr

CITATION

Çardak, O. (Ed.). (2025). *Current studies in educational and social sciences.* ISRES Publishing.

CONTENTS

SECTION 1:
EDUCATIONAL SCIENCES

THE PLACE OF MEDIA IN ENVIRONMENTAL EDUCATION AND ECO-MEDIA LITERACY[1]

Şule EGÜZ
Inonu University
ORCID: 0000-0002-3633-8957
E-mail: suleeguz@gmail.com

INTRODUCTION

Countries in both developed and developing countries are struggling with serious environmental problems. Therefore, the media needs to set an agenda for environmental issues and prioritize them to raise awareness as well as save lives. As is known, the role of the media focuses on three main points: informing, educating and entertaining. Therefore, one of the most important functions of the media is to increase public knowledge about the most pressing global and local issues, such as the environment. In addition, the news media's interest in environmental issues affects the importance of the issue in the eyes of the public. Indeed, the media uniquely shape public opinion and inspire positive behaviour through the clear and timely portrayal of ecological concerns.

When used effectively, media can be a viable channel for strengthening environmental awareness. Today, media plays an increasingly important role, shaping the lives of individuals and the entire society. This power should also be used to protect the environment and develop environmental behaviour in civil society. Media is critical to environmental education as it is not only a mirror reflecting environmental issues but also a powerful tool that can shape the narrative, influence behaviour, and drive the necessary policy changes for environmental protection. The connection between media and ecology is included in the literature through a framework called eco-media literacy. In this type of literacy, the necessity of basing media literacy on an ecocentric ethic is underlined.

1. Environment

The word "environment" is derived from the French word "environner," meaning to surround or enclose (Prasad, 2021). The term ‘environment’ is complex and ambiguous. It carries different meanings depending on its possible

1 This study was supported by the "Inonu University Scientific Research Projects Coordination Unit" within the scope of the project coded SBA-2024-3677, and current contents related to the subject were presented in the relevant study.

characteristics, and therefore the word 'environment' is usually accompanied by an adjective indicating its importance. One might consider a natural, social, cultural, urban or digital environment; in almost all cases the word 'environment' is used synonymously for space, region, place or ecosystem (Buongiorno & Chiaramonte, 2023; Tekdal, 2024). The environment is a complex system consisting of physical, chemical and biological factors, living and non-living elements and the relationships between all organisms living on the planet (Buongiorno & Chiaramonte, 2023).

The environment is considered as an inseparable whole, consisting of interacting systems of physical, biological and cultural elements that are interconnected in countless ways, both individually and collectively. Physical elements (space, landforms, water bodies, climate, soils, rocks and minerals) determine the changing characteristics, opportunities and limitations of human habitats. Biological elements (plants, animals, microorganisms and humans) constitute the biosphere. Cultural elements (economic, social, political) essentially include man-made features that enter into the formation of the cultural environment (Dubey & Singh, 1983). In this respect, the environment belongs to all biotic and abiotic components and is therefore vital for everyone (Prasad, 2021). It encompasses both living and non-living components, as well as the interactions and consequences between them. The term "environment" encompasses various types of environments, including natural and socio-cultural environments. The environment is not only an ecological entity that exists independently of human influence; it is also a cultural, social and political structure. It represents the totality of chemical, biological, physical and social factors that affect the behaviour of living and non-living entities. In general, the environment serves as the common habitat for all living organisms and defines the area in which they sustain their life (Sülün & Kışoğlu, 2019; Şimşek, 2021). Environment is an environment where people continue all their social, biological and chemical activities. When examining the environment, it is considered as natural and artificial environment. The natural environment is a natural entity that has not been created by humans and has not been interfered with or contributed to by humans. The artificial environment, on the other hand, is all the entities created by humans by making use of the natural environment from the beginning of humanity to the present day (Uşak, 2007).

The artificial environment, on the other hand, is all the entities created by humans by making use of the natural environment from the beginning of humanity to the present day. This means that man requires a conducive atmosphere to carry out his cultural, social, economic and political activities. However, people's negative attitudes towards the environment are causing much concern. Therefore, there is a need for effective education so that people can avoid activities that may make the environment unfavourable and unproductive in the context of the development processes of society through both formal and informal procedures (Edinyang, Enerji, Tijani & Dunnamah, 2013).

2. Environment Education

The idea that education could be a tool to spread knowledge and help protect the natural environment gained importance from the 1960s onwards (Pavlova, 2013). Environmental education emerged as a distinct discipline in the mid-1960s, drawing on a range of disciplines including conservation education, nature education and geography education (Roth, 1992). Derived from earlier disciplines such as nature studies and conservation education, environmental education has developed into a multifaceted field that examines the subtleties and potentials of human-environment interactions and the role of education in fostering sustainable relationships (McBride, Brewer, Berkowitz & Borrie, 2013). The Stockholm Conference on the Human Environment in 1972 emphasized the need for an environmentally focused education system that would solve the environmental crisis by producing environmentally conscious citizens (Sinha, Jangira, Das & Jacobson, 1985As formalized in the world's first intergovernmental conference on environmental education (Tbilisi Declaration, United Nations Educational, Scientific and Cultural Organization [UNESCO] and United Nations Environment Programme [UNEP], 1977), the initial goals of environmental education were to promote global public knowledge about environmental problems and to increase the motivation and skills of individuals to protect or improve the natural environment. Later, educational approaches were developed that encompassed social and economic sustainability as well as environmental sustainability (Pavlova, 2013). At this point, while environmental education provides future generations with the basic knowledge, skills and awareness necessary for sustainability, ongoing environmental problems have revealed the need for more efforts towards environmental sustainability (Ay, Atasoy & Güleç**, 2023).**

Environmental education is a pragmatic response to environmental destruction. Environmental education is a type of education that aims to make students aware of the problems related to their environment so that they can address these problems with a sense of responsibility and with the technical skills that will enable them to contribute to their solutions together with other members of their society (Ganesan & Magalingam, 2017). In other words, environmental education is the process of developing environmental awareness, gaining positive and permanent behavioral changes, protecting values, and equipping individuals and society with the necessary knowledge, values, skills, experience and determination to address and solve environmental problems (Tutar & Kurt, 2019). The key to solving current problems and preventing future ones lies in developing an educated population that recognizes the interconnectedness of human and natural systems. To meet these challenges, environmental education requires the use of a multitude of activities to educate individuals of all ages and communities of different sizes to explore their environment, develop critical thinking and problem-solving abilities, and make informed decisions regarding the use of the environment and the conservation of resources and the environment (NEEAC, 2015). Systematic information on the importance of understanding and using natural resources for human development and progress is provided through environmental education. Focal points of environmental education (Ganesan & Magalingam, 2017);

•To expose students to the real world, the nature and social environment in which they live, and to make them interested in reality.

•To enable students to analyze, evaluate and draw inferences about environmental problems and issues.

•To enable students to understand environmental issues and take positive environmental actions.

•To develop environmental action skills among students to facilitate humanity's journey towards sustainability.

Environmental education aims to develop ecological, economic, social and political awareness as well as problem-solving skills and a sense of individual responsibility to prepare students for responsible action and leadership in addressing current and future environmental problems (Roth, 1968). This lifelong education guides students to develop the skills needed to understand and connect with their immediate environment. The awareness, knowledge, and skills gained from this understanding provide a foundation for addressing larger systems and broader problems (NAAEE, 2022). Environmental education does not favor one perspective or activity over another. Instead, environmental education teaches people to think critically about different aspects of an issue. It also helps a person develop decision-making and problem-solving skills. The main purpose of environmental education is to provide information about the principles necessary for the protection and use of natural resources for the existence of humanity. The general objectives of environmental education are as follows (Prasad, 2021):

•To develop students' awareness of the environment and environmental problems.

•To help students understand the interrelationship between humans and the environment.

•To inform students about social norms that ensure integrity with environmental features.

•To create positive attitudes among students towards the environment.

•To develop appropriate skills necessary for educational evaluation and the achievement of environmental education objectives.

•To help students realize the importance of taking appropriate steps to solve environmental problems.

•To develop the sense of curiosity among students to make them aware of environmental problems so that they are inspired to work towards solving such problems.

•To create appropriate situations for students to participate in decision-making on the environment.

•To develop the ability to use skills to achieve the goals required to recognize and solve environmental problems through social, political, cultural and educational processes.

•To enlighten people about the physical components of the environment.

•Informing them about their dependence on environmental resources.

•To enlighten them about the changes that have occurred in the environment over the last decade and the consequences of their current actions.

•To warn them about the consequences of human actions on both human beings and other life forms.

•To raise concern for environmental quality and conservation and to promote understanding of human relationships and interactions with the ecosphere.

•To develop personal, social and national ethics of cleanliness and protection.

•To foster appreciation of the aesthetic quality of nature to encourage its use for recreational purposes.

The goal of all environmental educators is to develop educational perspectives for environmental learning. In this regard, environmental education should play a leading role in bringing the complexity of the environment and the challenges it poses to society to the attention of educators. Environmental education should offer a comprehensive lifelong learning content that is sensitive to developments in a rapidly changing world. Understanding the major problems of the contemporary world should prepare the individual for life by providing the skills and qualifications needed to play a productive role in improving life and protecting the environment, with due regard for ethical values. In general, good environmental education should move students from their immediate perceptions and experiences toward a broader understanding.

3. The Role of Media in Environmental Education

With its wide reach and impact capacity, mass media is a highly potential tool for educating the public and thus changing people's mindset. It has the power to transform people's lives by empowering them in many different ways. Information and knowledge from various sources serve this purpose. The media, the fourth pillar of democracy and a constantly active support for society, has an important task: to make people aware of impending dangers or threats facing society. Even the mass media have played their important roles in times of peace and crisis. Thanks to their functional roles of providing information, education and awareness, the media has become central to the discussion and debate of various events and issues, including environmental awareness (Singh, 2012).

The media is an effective way to draw attention to environmental problems, make the public aware of the problems created by pollution and thereby create public pressure to do something about it. Scientific reports highlighting the threats posed by climate change and the energy crisis to the future of our planet, developments in environmental technologies, and the activities of non-governmental organizations enable the media to monitor the environment more closely. In this context, the main task of the media in the environmental field

is not only to inform the public about environmental problems and address the reactions to them, but also to raise awareness and educate people (Ors, 2012). The media plays an important role by making diverse scientific information accessible and understandable to the public. The media plays an important role by making diverse scientific information accessible and understandable to the public (Cox, 2013). Therefore, one of the main functions of the media is to disseminate information. In the field of environmental communications, this means providing audiences with up-to-date news about environmental threats such as climate change, deforestation, and pollution. This type of reporting can make complex environmental issues more accessible to the general public, highlighting the importance of urgent and sustainable action. Through sustained reporting, media organizations foster a sense of urgency and collective responsibility by ensuring that pressing environmental issues remain at the forefront of public awareness (Development Journalism for Social Change, 2023). Because when environmental conditions change, the role of human society may be disrupted. However, media plays an important role in connecting the world to an individual and gives people the opportunity to communicate with a larger community of people (Ekayani, Ridho & Darusman, 2016). Disseminating information and reporting on environmental developments (whether voluntary or compulsory) are essential functions that meet the basic needs of contemporary television viewers, which are intrinsically linked to human well-being. Neglecting these responsibilities can have serious consequences for society (Taghavi, 2016).

By creating comprehensive awareness, incentivizing policy decisions, and fostering a culture of sustainability, the media provides significant support to global policy efforts to protect the environment for future generations (Saneh, 2018). In this context, environmental education can take place in formal and informal frameworks as well as in informal forms. This last form occurs in the family, in peer groups, during events organized by different institutions and also through the media. Indeed, a sustainable future requires much broader networks (Lukk, Veisson & Ots, 2008). Newspapers, radio and television have long been the primary sources of information for the masses. While traditional media still has significant influence, it is struggling to keep pace with the rapid dissemination of information through digital channels. However, the depth and credibility of traditional media outlets continue to play an important role in serious environmental journalism. Environmental documentaries on television or at film festivals and investigative articles in newspapers continue to play a central role in influencing public attitudes towards environmental protection (Development Journalism for Social Change, 2023; Koçoğlu, 2023).

Media outlets also serve as advocates for environmental causes. Not only does it inform, it also actively campaigns for change. Advocacy journalism, shaped by raising awareness and encouraging action, is an important part of environmental media. News organizations, documentaries, and social media influencers often highlight environmental issues and offer solutions or take a leading role in prompting action (Development Journalism for Social Change, 2023). Therefore, media plays an important and valuable role in public

awareness. It is imperative that the culture of living in a sustainable and healthy environment becomes a social norm. As influential and comprehensive platforms, the media, especially television channels, play an important role in educating and raising public awareness about environmental sustainability. These institutions should diligently and effectively carry out their responsibilities to promote environmental management. In this context, future generations and today's people must know the importance of sustainability, internalize it, act accordingly in their daily lives, and become conscious media consumers.

4. Eco-Media Literacy

The primary goal of media literacy education is to prepare the public to engage critically with media culture and provide them with opportunities to "access, analyze, evaluate, create, and act" as media consumers, creators, and citizens (Hobbs, 1998; Kellner & Share, 2005; Koçoğlu, 2019). Eco-media reframes media as ecological media; that is, media in the broadest sense is a material reality within and part of our environment (Ivakhiv & López, 2024). Eco-media literacy is an emerging field of media literacy that teaches the integrated relationship between media and living systems. It is a holistic framework that explores the ecological "footprint" and "mindprint" of media as a driver of environmental problems and solutions. It involves critically examining the impact of media and communication technology on the physical environment and explores the ways in which media systems disseminate beliefs about the relationship between people and the living systems that sustain them. It also recognizes the positive contributions of media to solving the environmental crisis by advocating for youth media, community participation, alternative media and global citizenship to promote sustainability (López, 2019). Eco-media literacy fosters an approach that encourages the examination of ecomedia elements: media texts (advertisements, news articles, television commercials, websites, films, etc.), platforms (streaming services, social networks, media outlets), devices (smartphones, tablets, computers, etc.), and hyperobjects (anamorphic distributed phenomena that behave like a system in the internet, fake news, or the media industry) (López, 2020). Eco-media literacy combines environmental issues and sustainability with media literacy. Broadly speaking, an ecomedia literacy approach has two broad areas of inquiry: The first of these is the 'ecological footprint' of media technologies and the other is the 'ecological mindprint' of the knowledge and culture produced by media systems (López, 2019).

Eco-media literacy, following the environmental communication tradition, also recognizes that media require symbolic action that can hinder or promote environmental sustainability. Symbolic action is the way discourses (visual, verbal and textual) construct environmental problems and solutions (López, 2019). Ecomedia literacy provides a framework for educators to teach students how to critically access, analyze, evaluate, and create media from an ecocritical perspective and provides students with the opportunity to address the issue of ecojustice (López 2020). In general, it aims to encourage a transformative change in cultural behaviors, attitudes and media practices by motivating

people towards eco-media literacy, eco-ethical norms and eco-citizenship (López 2022).

Like critical pedagogy, ecomedia literacy is not neutral or apathetic: recognizes that our global ecosystems are in danger and calls for interventions in media literacy practices to promote environmental sustainability (López, 2019; Koçoğlu, Tekdal & **Çetinkaya**, 2022). In summary, eco-media literacy has the following learning objectives within the scope of Bloom's Taxonomy (López, 2020):

•Interpret (understand) how media impacts biodiversity loss, water and soil pollution, climate change, how they are materially linked to living systems and how they affect the health of workers;

•To investigate (analyze) how ICTs are interconnected with the global economy and development models, how the current globalization model relates to the history of colonialism and its impacts on living systems and ecojustice;

•Distinguish (analyze) how the media create symbolic connotations and discourses that support environmental ideologies and ethics;

•To evaluate the phenomenological impact of media on the perception of time, space and place (evaluation); and

•Implementing new and alternative media uses that promote eco-ethics and eco-citizenship (implementation).

Eco-media literacy-based interventions aim to improve individuals' understanding of ecological concepts and encourage environmentally friendly actions (Gustian, Fasli & Boeriswati, 2022). Eco-media literacy interventions that utilize a variety of educational tools such as storytelling, digital learning, and interactive teaching materials can effectively foster empathy, community engagement, and observation skills relate to environmental protection (Ninsiana Septiyana, & Suprihatin, 2024). In particular, incorporating eco-media literacy into educational settings through innovative learning environments such as web-based modules, virtual reality, and mobile learning can play an important role in developing eco-literacy skills among students. These approaches not only provide thematic materials and representations of real-world issues, but also offer engaging and interactive platforms for developing eco-literacy (Wulandari, Susantini & Hariyono, 2024).

Conclusion

The purpose of the research and the problem/questions/hypotheses of the research should be presented as a subheading in the “Introduction” section. The media undertakes a very important mission in raising public awareness within the scope of environmental education. Nowadays, environmental problems have become a global threat. In this context, the media is an effective communication tool in creating public pressure by drawing public attention to environmental pollution, revealing those responsible for environmental pollution, and raising people's awareness about the environment. Showing

environmental impacts through photos, videos, and graphics plays a key role in engaging and raising awareness among viewers. Social media, which has become one of the most popular media tools in recent years, raises people's awareness by offering options such as sharing environmental problems with followers and finding solutions to them. Environmental awareness serves as an intrinsic motivator for individuals to engage in environmental protection behaviors, and social media platforms can also promote such awareness.

Different media tools and platforms can attract different types of users by meeting various needs. Information diffusion effects may vary due to the diverse and complex information environment, media logic, and diffusion characteristics of each media vehicle. Global media channels reach approximately 1.5 billion people worldwide. Therefore, it can be concluded that most people have become conscious about the environment through the media. The media can be used as a tool to break the silence around environmental issues and create an environment that encourages discussion on how society can participate and change its behavior. In summary, it is very important to raise public awareness about environmental problems. In this process, eco-media literacy comes to the fore. Because eco-media literacy recognizes that our global ecosystems are in danger and promotes environmental sustainability.

REFERENCES

Ay, S., Atasoy, E. , & Güleç, S. (2023). Historical development of environmental education in the world and in Turkey, *International Scientific Conference,* pp. 217-226.

Buongiorno, F. , & Chiaramonte, X. (2023). *Environment.* https://link.springer.com/chapter/10.1007/978-3-031-25910-4_8

Cox, C. (2013). From cameras to camtasia: Streaming media without the stress. Miller, W. , & Pellen, R. M. (Eds.), *Internet reference support for distance learners* (pp. 8-14). US: Routledge.

Development Journalism for Social Change. (2023). *The role of mass media in environmental awareness and action*. https://journalism.university/development-journalism-for-social-change/mass-media-environmental-awareness-action/

Dubey, K. K. , & Singh, A. K. (1983). *Urban environmentin India.* New Delhi: Deepand Deep.

Edinyang, S. D., Enerji, C. V. O., Tijani, A. O. , & Dunnamah, A. Y. (2013). Environmental and social studies education: A collaborative approach towards building an environmentally friendly society. *Educational Research, 4*(3), 222-226.

Ekayani, M., Ridho, D. , & Darusman, D. (2016). Forest policy and economics the role of scientists in forest fire media discourse and its potential in fluence for policy-agenda setting in Indonesia. *Forest Policy and Economics, 68,* 22-29.

Ganesan, P. , & Magalingam, A. (2017). *Environmental education.* https://www.tnteu.ac.in/pdf/environmental.pdf

Gustian, R., Fasli, J. , & Boeriswati, E. (2022). Improving student's eco-literacy skills through the use of the eco-literacy module. *Indonesian Journal of Social Research, 4*, 178-186.

Hobbs, R. (1998). The seven great debates in the media literacy movement. *Journal of Communication, 48*(1), 16-32.

Ivakhiv, A. , & López, A. (2024). When do media become ecomedia? A. López, Ivakhiv, A. and Rust, S. (Eds.). *The Routledge Handbook of Ecomedia Studies* (pp. 19-34). London and New York: Routledge.

Kellner, D. , & Share, J. (2005). Toward critical media literacy: Core concepts, debates, organizations, and policy. *Discourse: Studies in the Cultural Politics of Education, 26*(3), 369-386.

Koçoğlu, E. (2023). *Digital obesity in education.* Ankara: Pegem Akademi Yayınları.

Koçoğlu, E. (2019). Basic concepts related to media literacy and education. E. Koçoğlu, Ö. Akman (Ed.). *Media literacy and education* (pp. 14-21). Ankara: Pegem Akademi Yayınları.

Koçoğlu, E., Tekdal, D. , & Çetinkaya, N. (2022). Pedagogical literacy scale: A scale development study. *Educational Research and Reviews, 6*(17), 176-186.

López, A. (2019). *Ecomedia literacy.* https://antonio-lopez.com/ecomedia-literacy/

López, A. (2020). Ecomedia literacy: Educating with ecomedia objects and the ecomediasphere. *Digital Culture , & Education, 12*(2), 1-17.

López, A. (2022). Gaslighting: Fake climate news and big carbon's network of denial. J. McDougall , & K. Fowler-Watt (Eds). *Palgrave Hand-book of Media Misinformation.* (pp. 159-177). London; New York: Palgrave MacMillan.

Lukk, K., Veisson M. , & Ots, L. (2008) Characteristics of sustainable changes for schools. *Journal of Teacher Education for Sustainability*, *9*, 35-44.

McBride, B. B., Brewer, C. A., Berkowitz, A. R. , & Borrie, W. T. (2013). Environmental literacy, ecological literacy, ecoliteracy: What do we mean and how did we get here? *Ecosphere 4*(5), 1-20.

National Environmental Education Advisory Council [NEEAC]. (2015). *2015 report to the U.S. environmental protection agency administrator.* https://www.epa.gov/education/national-environmental-education-advisory-council-2015-report-administrator

Ninsiana, W., Septiyana, L. , & Suprihatin, Y. (2024). Introducing eco-literacy to early childhood students through digital learning. *Journal of Education and Learning, 18*, 89-96.

North American Association for Environmental Education [NAAEE]. (2022). *Environmental education programs: Guidelines for excellence.* https://eepro.naaee.org/guideprograms

Ors, F. (2012). Environmental education and the role of media in environmental education in Turkey. *Procedia - Social and Behavioral Sciences, 46,* 1339-1342.

Pavlova, M. (2013). Towards using transformative education as a benchmark for clarifying differences and similarities between environmental education and education for sustainable development. *Environmental Education Research, 19*(5), 656-672.

Prasad, S. (2021). *Concepts and components of environment.* https://dspmuranchi.ac.in/pdf/Blog/satyapriya52dspmucomS12.pdf

Root, D. (2005). Music as a cultural mirror. *Magazine of History, 19*(4), 7-8.

Roth, C. E. (1968). *Curriculum overview for developing environmentally literate citizens.* https://files.eric.ed.gov/fulltext/ED032982.pdf

Saneh, A. (2018). The role of media in environmental awareness: An overview. *Inspira-International Journal of Modern Management , & Entrepreneurship, 8*(2), 1-5.

Singh, S. (2012) Environmental concerns and role of media in environment management: A few possibilities. *Management Dynamics, 12*(2), 71-80.

Sinha, S., Jangira, N.K., Das, S. , & Jacobson, W. J. (1985). *Environmental education: Module for pre-service training of social science teachers and supevisors for secondary schools.* https://unesdoc.unesco.org/ark:/48223/pf0000065036

Sülün, A. , & Kışoğlu, M. (2019). Basic concepts of ecology. M. Kurt (Ed). *Environmental education* (pp. 54-86). İstanbul: Eğiten Kitap.

Şimşek, Ü. (2021). Matter cycle and natural balance. H. Tokcan, Y. Topkaya (Eds). *Environmental Education* (pp. 43-57). Ankara: Pegem Akademi.

Tekdal, D. (2024). Dijitalleşme sürecine ilişkin problemlerin sosyal bilgiler eğitiminde değerlendirilmesi. Koçoğlu, E., Egüz, Ş. (Ed.). *Modüler bağlamda sosyal bilgiler (Dijitalleşme temelli bakış).* Ankara: Pegem Akademi.

Taghavi, L. (2016). *Investigating the importance and position of the media in environmental protection with a sustainable development approach.* Tehran: Media Studies.

Tutar, M. , & Kurt, M. (2019). Evaluation of primary school and preschool curriculum in terms of sustainable environmental education. M. Kurt (Ed). *Environmental Education* (pp.159-170). Ankara: Eğiten Kitap.

Uşak, M. (2007). What is the environment? M. Aydoğdu, K. Gezer (Ed.). *Environmental science* (pp. 1-8). Ankara: Anı Yayıncılık.

Wulandari, F. E., Susantini, E. , & Hariyono, E. (2024). Web-based module on biotechnology: Fostering preservice science teachers' eco-literacy skills. *International Journal of Educational Methodology, 10,* 45-63.

ABOUT THE AUTHOR

Şule EGÜZ is born in Sivas, the author completed his primary, secondary, and high school education there. She graduated from Sivas Cumhuriyet University, Faculty of Education, Department of Social Studies Education, ranking first in his class in 2007. She worked as a Social Studies teacher at Sivas Yunus Emre Primary School during the 2008-2009 academic year. She worked as a research assistant at Ondokuz Mayıs University, Faculty of Education between 2010 and 2017. She completed her master's degree in Social Studies Education at Ondokuz Mayıs University, Institute of Educational Sciences in 2011. The author, who began her doctoral studies at Marmara University in 2012, received her doctorate in 2017 with her doctoral dissertation titled "Teaching Achievements Related to Global Education in Social Studies Courses Using Communication Technologies." In 2018, she was appointed as an assistant professor in the Department of Social Studies Teaching at İnönü University's Faculty of Education. The author, who received the title of associate professor in March 2021, still continues her academic life at the same university and continues her studies on teacher education, art and museum education, media literacy and global education.

Similarity Index

The similarity index obtained from the plagiarism software for this book chapter is 20%.

To Cite This Chapter:

Egüz, Ş. (2025). The Place of Media in Environmental Education and Eco-Media Literacy. In O. Çardak (Ed.), *Current Studies in Educational and Social Sciences 2025* (pp. 2-13). ISRES Publishing.

THE PROCESS OF DIGITALIZATION IN EDUCATION AND ITS ADVERSE EFFECT: DIGITAL OBESITY

Prof. Dr. Erol KOÇOĞLU
Inönü University
Faculty of Education
ORCID: 0000-0003-4595-2892
E-mail: erol.kocoglu@inonu.edu.tr

Introduction

Digitalization, which is increasing its pace of development globally every day, is affecting human life in every way. We see the positive and negative reflections of digitalization on various aspects of life every day in the written and visual media. However, we must not forget that the contributions of the digital world can be further enhanced through conscious use. For example, digital technologies that provide platforms enabling collaboration and connectivity in our daily lives are opening up opportunities to gain knowledge about new and important topics, and it is observed that they can take innovation to places that were unimaginable just a few years ago. Extraordinary developments in technology associated with the digitalization process have also brought about significant reflections in the education process. In other words, the new digital age has changed the way many people access, use, and respond to information, both in educational institutions and in learning environments where the teaching-learning process takes place. The digitalization process, which has narrowed the boundaries of the educational world, has made the use of digital technologies mandatory in the global world. This necessity has brought about the emergence and use of powerful tools that can help develop education in various ways, such as facilitating the creation of teaching materials by educators and providing new methods for people to learn and collaborate.

Although there are many problems encountered in the process of digitization in education, the most important of these are the digital learning environment used and the orientation of teachers, parents, and students. In this study, the concept of digital obesity, which is observed in students who fail in this adaptation process and is referred to as the pandemic of the age, was examined.

ISBN: 978-625-6959-98-9

1. Knowledge of Concepts Related to the Digitalization Process in Education

1.1. Digitalization

One of the fundamental concepts of the globalization process is digitalization. Digitalization, which is one of the key actors in today's world, is an important concept that encompasses many characteristics that affect every aspect of life. This characteristic of the concept stems from its ability to be quickly adopted and to have a rapid impact. This concept, which encompasses these characteristics, is the basis of today's world, which is digitalization-based, unlike previous times.

It can be said that it enables description by separating them from their contexts. The popularity of this concept in today's world can be considered a result of the momentum gained in the digitalization process. The momentum gained in the digitalization process has brought about an increase in the spread of technology use in all areas of life (Koçoğlu, 2023). It is possible to encounter striking definitions of the concept of digitalization, whose popularity continues to increase with each passing moment, made by experts around the world. According to the IT Dictionary of Gartner, a company specializing in research and analysis in the United States that has come to the fore with its work in the field of technology, “Digitalization (digitization) is the process of transitioning from analog to digital form.” “The use of digital technologies to transform a business model and create new opportunities for revenue and value generation,” and “The process of transitioning to a digital business” are definitions observed in scientific studies. (Yankın, 2019; Koçoğlu & Egüz, 2024).

By positioning itself at the center of the era, digitalization, which seeks to redesign the world according to its own terms, emphasizes the increase in the factors that existing resources provide to the work-action process in a benefit-based manner. This perspective has led businesses to reevaluate themselves in the business world based on technology and to make certain changes in line with the times. While doing so, incorporating applications oriented toward technology in line with temporal needs will facilitate adaptation to technology-based tools. In this context, the use of either digitalization or technology concepts in any dimension that serves life based on consciousness and awareness can provide new opportunities and gains.

In today's world, the concept of digitization is expressed as the driving force behind technology-based progress and developments. In other words, it is “an important global phenomenon that involves the ability to convert analog messages (words, images, letters, etc.) into data that can be transmitted, processed, and stored electronically in various forms” (Ormanlı, 2012; Koçoğlu & Egüz, 2024).

Digitalization, which has completely surrounded us in our daily lives and found its place in all our daily activities, is based on the harmony between life and technology. The goal worldwide is to achieve this harmony in a short period of time. This process, which encompasses change, transformation, and

obesity, is based on the procurement of digital equipment and its proper and qualified use in accordance with needs. Qualified use refers to the evaluation of digital technology in educational environments with the aim of increasing its functionality. Prior to this functionality, the procurement of digital equipment it is coming. The relevant ministries and school administrations preparing these tools according to learning environments can also have a positive impact on meaningful, concrete, and qualified learning-teaching processes in learning environments (Ersöz & Özmen, 2020). Therefore, evaluating the concept of digitalization and its reflections in the process in a multidimensional manner can contribute to increasing individual and social awareness of this concept (Koçoğlu, 2023; Koçoğlu & Egüz, 2024).

In the 21st century, digitalization contributes to the education system by utilizing the highest form of development. Unlike traditional ways of acquiring knowledge, digitalization is based on a coding system, and the communication process is carried out at high speed and with multi-layered interaction. Therefore, it can be said that this system has a significant impact on facilitating human life as a result of a visual message being composed of digital codes (Sunal, 2016; Koçoğlu & Egüz, 2024).

1.2. Digital Literacy

Digital literacy, one of the subcomponents of literacy and one of the most prominent types of literacy in today's world, plays a pivotal role in shaping social interactions between individuals and communities. As such, it is among the most essential elements required for digital technology-based interactions (Lankshear & Knobel, 2003; Egüz, 2022). However, equating digital literacy with digital technologies may lead to a superficial understanding of the concept. This is because the concept of literacy evokes a wide range of competencies, skills, and knowledge (Cope & Kalantzis, 2000; Egüz, 2022). This literacy is based on acquiring and applying the skills necessary for users to work actively in a digital environment during the education process. Digital literacy, which will be accepted as a measure in evaluating the quality of learning activities in the digital environment, supports a user-centered approach (Eshet Alkalai, 2004; Koçoğlu & Egüz, 2024).

Of course, being literate is necessary for digital literacy, but it is not a sufficient condition (Belshaw, 2012; Egüz, 2022). According to Hobbs (2011, cited in Egüz, 2022), digital literacy competencies include the following characteristics:

- Access: Use of technologies to access information,
- Analysis and evaluation: Higher-level skills such as evaluation, analysis, and synthesis,
- Creation: Ability to create and produce Works,
- Reflection: Participation in reflective thinking,
- Transition to action: The activity of sharing information individually and collaboratively in a public forum.

Digital literacy, which encompasses so many features, involves a multifaceted approach to learning. It is linked to independent learning and lifelong learning strategies. It is believed to be a prerequisite for literacy and "creates a framework for learning to teach by encouraging individuals to think critically and helping them" (Jeffrey et al., 2011).

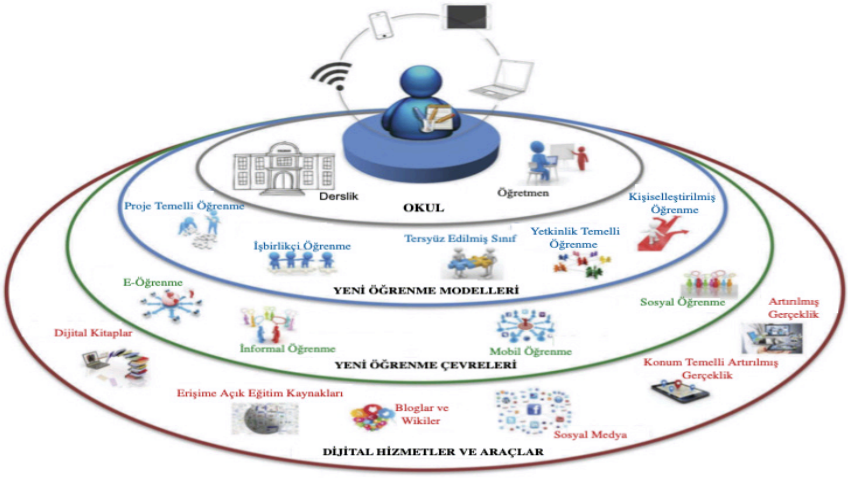


Figure 1. *Digital literacy in the information society (Pérez-Escoda, García-Ruiz & Aguaded, 2019).*

As shown in Figure 1, in order to embrace the need for digital literacy, it is necessary to be open to changes over time in the elements of the educational ecosystem that are linked to the development of this literacy. The figure shows new learning environments, emerging communicative narratives, and techno-pedagogical methodologies that maximize learning potential through technological resources (Pérez-Escoda, García-Ruiz & Aguaded, 2019; Koçoğlu & Egüz, 2024).

1.3. Technology

The word "technology" originates from the Greek word "technologia." The word "teche" means "craft, skill, handicraft," and 'logia' means "product." Technology is a broad term that refers to the knowledge of craftsmanship used in products (Smaldino, Lowther, Russell & Mims, 2007; Koçoğlu & Egüz, 2024). Alkan (1997) defines technology as the effort to create functional structures necessary to dominate nature by applying acquired skills. According to İşman (2008), technology is the application of observation-based and proven information to achieve specific goals and solve specific problems. James Finn, a well-known educational technologist, defines technology as perspectives used to find solutions to problems arising from humans or devices in the tools and systems used while utilizing information and communication technologies (Finn, 1960; Koçoğlu & Egüz, 2024).

1.4. Digital Obesity

With the development of internet technology, the structure of the concepts of access and acquisition is changing in our increasingly globalized world. This change brings with it certain conveniences from both an individual and societal perspective in the process of accessing information or acquiring content related to any given topic. These conveniences can be considered one of the most important causes of digital dependency. The resulting dependency increases individual and societal interest in digital products and applications, leading to the emergence of digital obesity (Koçoğlu, 2023; Koçoğlu & Egüz, 2024).

Digital obesity is a condition that manifests itself as an inability to disconnect from digital devices or function without them, resulting from excessive use of digital tools. This condition leads to the individual becoming isolated and lonely, completely withdrawing from all environments to which they are connected through family, friends, and other affiliations. The resulting outcome triggers the individual's attempt to seek acceptance in the virtual world by losing their sense of trust in the external world. In this cause-and-effect relationship, digital obesity causes the affected individual to seek validation from the virtual environment through the digital device they cannot part with, leading them to participate in and carry out certain activities in the real world. The path followed by the digitally obese individual can be described as the significant effect of digital obesity on addicted individuals (Koçoğlu, 2023). Digital obesity, which refers to the excessive consumption of digital information, is the disease of the postmodern individual. This is because digital obesity stems from the misuse and inappropriate use of technology, which leads to inactivity and technological addiction (Koçoğlu & Egüz, 2024).

1.5. The Digital Age

The current state of technology in today's world has brought about many new developments. Among these technological developments, the widespread use of Web 1.0 and Web 2.0 applications has led to computers, tablets, headphones, smartphones, and watches becoming central to human life. As these technological products have come to exert a greater influence on human life compared to previous eras, experts and researchers in the field have coined the term “digital age” to describe the current era (Şabanoğlu & Yılmazdoğan, 2022; Koçoğlu & Egüz, 2024). In this age dominated by information and communication technologies, it can be said that many problems have arisen alongside the positive developments that have taken place. Among the problems highlighted by experts working in this field, the most prominent are orientation-based issues caused by conflicts and differences between generations in a social context. The most prominent environments where these issues are observed in many institutions and organizations that make up society are educational institutions and the learning environments within these institutions (Egüz, Öztürk & Kesten, 2019; Koçoğlu & Egüz, 2024). The fundamental causes of this problem, which is also experienced in other institutions and organizations such as educational institutions, can be attributed to differences in the ability

to use technological developments and the products that emerge as a result of these developments (Koçoğlu, 2023; Koçoğlu & Egüz, 2024).

1.6. Digital Footprint

A digital footprint is, in general terms, the traces left by individuals in online environments. These traces can come from many different sources, such as shared posts and photos, emails, watched videos, shared personal information, etc. These traces are sometimes left consciously and sometimes unconsciously. It is defined as "any trace related to an individual that is transferred to the electronic environment by typing, clicking, or touching the keyboard, mouse, or screen" (Koçoğlu & Egüz, 2024). Users' digital footprints include not only the content they produce, photos, and videos they share on the digital media platforms where they carry out their digital activities, but also actions such as liking, favoriting, retweeting, following, or commenting, which are not considered content production by users. All of an individual's actions on digital platforms are added to their digital footprint. In addition to consciously produced content, our browsing history, search queries, location information, and online shopping—digital activities we consider private—are also included in our digital footprint. (Micheli, Lutz & Büchi, 2018; Koçoğlu & Egüz, 2024).

2. The Process of Digitalization in Education and Digital Obesity

The development of information and communication technologies around the world has brought about rapid change and transformation in every aspect of life, including education. This change and transformation, which began in the world of education and is still ongoing, has had many positive effects, but also some negative consequences (Koçoğlu, 2023). The convergence of humans and technology in learning environments within educational institutions has added a new dimension to the digitalization process in the world of education, while also highlighting the necessity of acquiring certain skills. These skills can be listed as recognizing technology, possessing the ability to use technology, and making the best use of technology. Individuals who acquire the ability to use technology can easily adapt to internet technology in learning environments, and their efforts to obtain critical knowledge related to this technology can be said to have a positive impact. Individuals who adapt to this process have the opportunity to get to know the digitalizing world more closely by using internet-based technology more frequently in the education process, and it can be said that it is inevitable that they will increase the frequency with which they follow developments in this world (Koçoğlu, 2023).

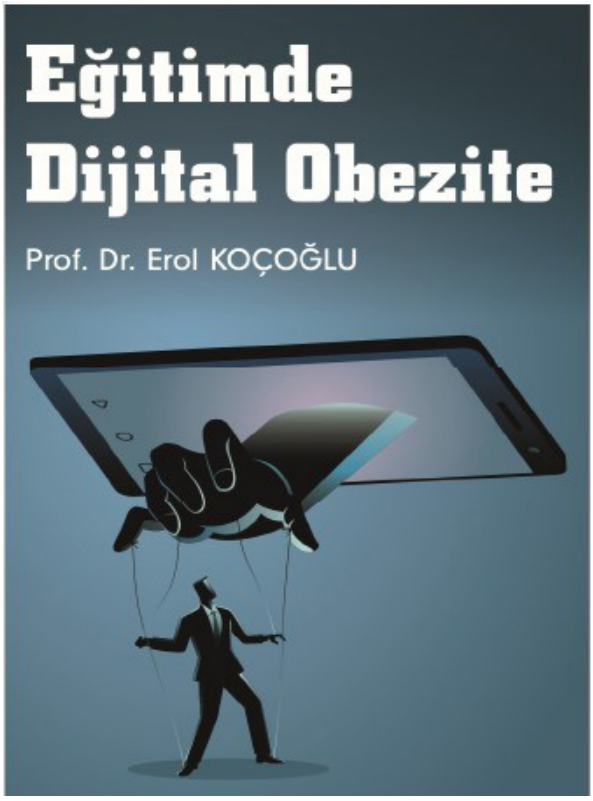


Figure 2. *Digital obesity in education book cover image (Koçoğlu, 2023).*

The process of digitalization in education is a concept that deserves the most attention in today's world. This concept has given rise to many flawed products or problems based on orientation in the process. Digital obesity is one of the most prominent of these and can be described as the fastest-spreading epidemic of our time. This epidemic is the result of the changes and transformations brought about by digitalization in the education process.

After the Covid-19 pandemic, the world, which has accelerated its pace of globalization along with digitalization, can be said to be facing a new pandemic. This epidemic, referred to as digital obesity, is based on the platforms that make up the virtual world achieving their own goals by consuming most of humanity's daily time for their own benefit. In this process, individuals who have become addicted to the virtual world and cannot live without it are choosing to live a life detached from the real world. When examining the age ranges of those who choose this lifestyle, it is evident that the majority are young people (12-40 years old). Considering that more than half of the individuals in this age group continue their education at various levels in educational institutions, it is not difficult to estimate the rate of digital obesity in the education process. Therefore, in studies conducted on the institutional impact of digital obesity in today's world, educational institutions come first among the priority institutions outside the family (Koçoğlu, 2023).

Digital obesity is defined as a condition resulting from excessive use of digital devices. Individuals who are digitally obese are inevitably faced with a range of physiological, mental, developmental, emotional, sociological, and psychological problems (Mustafaoğlu, Zirek, Yasacı & Özdinçler, 2018; Koçoğlu, Demir & Ulukaya Öteleş, 2022; Koçoğlu, 2023). Every day, the number of individuals facing these issues is increasing worldwide. These issues include physical disorders, withdrawal, isolation, self-loathing, and self-disapproval, among others. Indeed, while there were 3.66 billion social media users in 2019, it was determined that there were over 5 billion social media users in 2022 (Koçoğlu, Demir & Ulukaya Öteleş, 2022; Koçoğlu, 2023). Another study conducted specifically in the United States shows that Americans check their smartphones 50 to 80 times a day (Allcott, Gentzkow & Song, 2022; Koçoğlu, Demir & Ulukaya Öteleş, 2022; Koçoğlu, 2023). These rates obtained in these studies are a result of the widespread use of products with a high impact rate from an individual and social perspective, depending on the digitization process. In particular, developments in information and communication technologies (telephones, tablets, desktop and laptop computers, etc.) have led to an increase in the amount of time spent using these technologies during the day, along with the global interest in digital technology. The rate and purpose of daily digital use constitute the individual's addiction criteria. Individuals who spend more than half of their daily time in the virtual world through these means, except for activities that must be carried out and participated in remotely, such as work and education, have fallen victim to the digital obesity epidemic. These digitally obese individuals often find themselves unable to disconnect from the digital and virtual world, despite their desire to do so. This is because digitally obese individuals have adapted to the benefits and comforts of this world. The alluring aspects of the virtual world and the comfort it provides during the digitalization process have given rise to digital obesity, a condition more dangerous than the COVID-19 pandemic (Koçoğlu, 2023).

The concept of obesity is generally related to “overeating.” Digital obesity, on the other hand, is more prevalent during adolescence, but the damage it causes can negatively affect individuals in other stages of their lives as well. Individuals who spend a lot of time in the virtual world with digital products and applications and quickly consume all the content they encounter gradually become digitally obese. The digitalization that has been felt in almost every area of life, especially educational and social needs after the pandemic, has brought with it new habits and addictions. Therefore, at this point, it has become inevitable to discuss, debate, and keep the concept of digital obesity on the agenda more than ever before. In this regard, numerous studies conducted worldwide show that the number of cases of digital obesity has reached alarming levels and that digital obesity negatively affects physical, emotional, and cognitive development (Scherer, 1997; Harris & Straker, Pollock & Smith, 2015; Koçoğlu, Demir & Ulukaya Öteleş, 2022; Koçoğlu, 2023).

The concept of digital obesity, which arises from the unconscious use of the internet-based digital world out of curiosity, is one of the most important problems encountered in the education process and needs to be solved. If

these issues are not resolved, the likelihood of encountering the following consequences increases. These include:

- Attention deficit (during the learning and teaching process),
- Concentration and focus issues (towards the lesson and teacher),
- Negative impacts on academic development (such as pursuing unrealistic goals, learning by imitating characters in the virtual world, causing disciplinary issues by frequently using digital devices for non-academic purposes in the learning environment, questioning and underestimating the teacher's professional, subject-specific, and general cultural knowledge, verifying the accuracy of everything taught by cross-checking it with digital sources, preferring to learn from digital sources rather than from the teacher, etc.).

To prevent or resolve these outcomes in the educational process, every component of the educational process (teacher, student, school administration, guidance counselor, and parent) has important responsibilities. In fulfilling these responsibilities, awareness and competence in digitalization should be considered as a key criterion.

3. Conclusion

This study, titled "The Digitalization Process in Education and Its Flawed Outcome: Digital Obesity," is derived from the project titled "The Digitalization Process in Education and Digital Obesity," coded SBA-2024-3676, supported by the "Inönü University Scientific Research Projects Coordination Unit." In this regard, I would like to thank the Scientific Research Projects Coordination Unit at İnönü University. The study explored numerous concepts grounded in the digitalization process in education, as well as the digital obesity epidemic, one of the problems arising from this process. The study aimed to raise awareness by focusing on the consequences of the digital obesity epidemic in education. Digital obesity, a faulty product of the digitalization process, whose impact is increasing not only in education but also in every aspect of life, is a result of the unconscious meanings people ascribe to digital. This misunderstanding or misunderstanding negatively impacts digital addiction. Therefore, the process of digitalization in education needs to be carefully re-examined by experts from a multi-dimensional perspective and a student-centered perspective.

Acknowledgements

Digital Obesity," is derived from the project titled "The Digitalization Process in Education and Digital Obesity," coded SBA-2024-3676, supported by the "Inönü University Scientific Research Projects Coordination Unit." In this regard, I would like to thank the Scientific Research Projects Coordination Unit at İnönü University.

REFERENCES

Alkan, C. (1997). *Educational technology. Ankara: Anı Publishing.*

Allcott, H., Gentzkow, M. & Song, L. (2021). *Digital addiction* (No. w28936). National Bureau of Economic Research. Retrieved from: http://www.nber.org/papers/w28936

Belshaw, D. (2012). *What is 'digital literacy'? A pragmatic investigation.* http://etheses.dur.ac.uk/3446/1/Ed.D._thesis_(FINAL_TO_UPLOAD).pdf?DDD29+ 23.05.2024 tarihinde erişilmiştir.

Cope, B. & Kalantzis, M. (2000). *Multiliteracies: Literacy and the design of social futures,* London: Routledge.

Egüz, Ş. (2022). Digital literacy in education. Erol Koçoğlu (Ed.). Literacy Skills in Education I. Ankara: Pegem Academy Publications.

Egüz, Ş., Öztürk, C. & Kesten, A. (2019). Technology-supported global education: A mixed method study. *Pegem Education and Training Journal,* 4(9), 1209-1244.

Eshet-Alkalai, Y. (2004). Digital literacy: A conceptual framework for survival skills in the digital era. *Journal of Educational Multimedia and Hypermedia, 13*(1), 93-106.

Finn, J. D. (1960). Automation and education: III. Technology and the instructional process. *Audiovisual Communication Review,* 8(1), 5-26.

Harris, C., Straker, L., Pollock, C. & Smith, A. (2015). Children, computer exposure and musculoskeletal outcomes: The development of pathway models for school and home computer-related musculoskeletal outcomes. *Journal of Ergonomics, 58*(10), 1611-1623.

Hobbs, R. (2011). Empowering learners with digital and media literacy. *Knowledge Quest, 39*(5), 12-17.

Jeffrey, L., Hegarty, B., Kelly, O., Penman, M., Coburn, D. & McDonald, J. (2011). Developing digital information literacy in higher education: Obstacles and supports. *Journal of Information Technology Education: Research, 10,* 383-413.

Koçoğlu, E. & Egüz, Ş.(2024). Digitalization and technology-based concepts in social studies. Social Studies in a Modular Context (Digitalization-Based View), Volume IV. (Ed. E. KOÇOĞLU – Ş.EGÜZ). Pegem Academy Publications, Ankara.

Koçoğlu, E.(2023). Digital obesity in education. Pegem Academy Publications, Ankara.

Koçoğlu, E., Demir, F.B. & Ulukaya Öteleş, U.(2022). The digital obesity scale: A scale development study. African Educational Research Journal, 10(2), 117-124. Retrieved from: http://www.netjournals.org/pdf/AERJ/2022/2/22-021.pdf

Lankshear, C. & Knobel, M. (2003). *New literacies: Changing knowledge and classroom learning.* United Kingdom, UK: Open University Press.

Micheli, M., Lutz, C., & Büchi, M. (2018). Digital footprints: an emerging dimension of digital inequality. *Journal of Information, Communication and Ethics in Society, 16*(3), 242-251.

Mustafaoğlu, R., Zirek, E., Yasacı, Z. & Özdinçler, A. R. (2018). The negative effects of digital technology usage on children's development and health. *Addicta: The Turkish Journal on Addictions*, *5*(2), 13-21. Retrieved from: https://www.addicta.com.tr/en/the-negative-effects-of-digital-technology-usage-on-children-s-development-and-health-1312

Ormanlı, O. (2012). Dijitalleşme ve Türk sineması. *The Turkish Online Journal of Design, Art and Communication – TOJDAC, 2*(2), 32-38.

Pérez-Escoda, A., García-Ruiz, R. & Aguaded, I. (2019). Dimensions of digital literacy based on five models of development. *Culture and Education, 31*(2), 232-266.

Scherer, K. (1997). College life online: Healthy and unhealhty internet use. *Journal of College Life and Developmen*t. (38), 655-665.

Smaldino, S. E., Lowther, D. L., Russell, J. D. & Mims, C. (2007). *Instructional technology and media for learning.* New Jersey Columbus, Ohio: Pearson Merril Prentice Hall.

Sunal, G. (2016). The possibilities of virtual reality and digital cinema. Inonu University Faculty of Communication e-Journal,1(2), 294-309.

Şabanoğlu, C. & Yılmazdoğan, O. C. (2022). Digital natives, digital immigrants and tourism in the digital age. S. Morina & S. Kervan (Eds.). New Trends in Social, Human and Administrative Sciences. Izmir: Duvar Publications.

Yakın, M. (2006). Information communication technologies and media. Z. B. Akıncı-Vural (Ed.). Information communication technologies and their reflections. Ankara: Nobel Publishing Distribution.

ABOUT THE AUTHOR

Professor Erol KOÇOĞLU, Born in Çemişgezek, the author completed his middle and high school education at various schools in Elazığ. He graduated from the Department of Social Studies Education at Gazi University between 2000 and 2004. He completed his master's degree in Social Studies Education at the Fırat University Institute of Social Sciences between 2006 and 2008, and his doctorate in Social Studies Education at the Atatürk University Institute of Educational Sciences between 2009 and 2014, with a thesis titled "Evaluation of the Use of Cartoons in Social Studies Education Based on Accessibility." Koçoğlu, who contributed to the preparation of numerous textbooks and workbooks for the Ministry of National Education as an editor and writer, has authored numerous books, articles, and proceedings presented at international symposiums and congresses, particularly on Social Studies Education, and published in full text. Koçoğlu is married and has been working at İnönü University as an associate professor since 2018 and as a full professor since 2023.

Similarity Index

The similarity index obtained from the plagiarism software for this book chapter is 12%.

To Cite This Chapter:

Koçoğlu, E. (2025). The Process of Digitalization in Education and Its Adverse Effect: Digital Obesity. In O. Çardak (Ed.), *Current Studies in Educational and Social Sciences 2025* (pp. 14-25). ISRES Publishing.

INDIVIDUAL DIFFERENCES IN LEARNING MATHEMATICS: A PERSPECTIVE THROUGH THINKING STYLES

Doctoral Candidate Zeynep GÜRSOY
Hacettepe University
E-mail: zeynepgursoy@hacettepe.edu.tr
ORCID: 0000-0002-6142-1218

Associate Professor Zeynep Sonay AY
Hacettepe University
E-mail: sonayp@gmail.com
ORCID: 0000-0002-1037-7106

Introduction

Thinking is a mental activity that every individual performs actively. A style, on the other hand, refers to the manner in which something is done or a person's characteristic pattern of behavior or tendency (Sternberg, 1997). How individuals process information, structure a problem, and reach a solution is explained through thinking styles (Sternberg, 1988; Zhang & Sternberg, 2000). The fact that thinking is used in almost all daily activities, and that individuals employ different approaches while thinking, shows that thinking is a personally distinctive cognitive tendency and that various styles are used during this process (Riding & Rayner, 2000; Dinçer, 2009). Examining thinking styles extensively, Sternberg (1988) describes style not as a skill itself, but as the preferred way or ways of applying a skill. Many different classifications and labels for thinking styles have been introduced by various researchers (Krutetskii, 1976; Sternberg, 1988; Riding & Rayner, 2000; Entwistle, 1978; Kolb, 1976; Torrance & Rockenstein, 1988; Zhang, 2002), and it has been emphasized that thinking styles cannot be categorized as good or bad (Emir, 2011).

When style is mentioned in the literature, cognitive styles, learning styles, and thinking styles appear separately or together. Just as it is impossible to separate thinking from every component of education, it is also impossible to separate it from learning and cognition. According to Kolb and colleagues (2001), learning style reveals how an individual approaches the learning process; thinking style refers to the particular way of thinking, tendency, or strategy they prefer to use when performing a task within the learning process—in other words, the methods they prefer to use when processing information—in other words, the process (Sternberg, 1994). Therefore, while learning style answers the question, "How do I learn?", thinking style focuses on the question, "How do I think and solve problems?". Therefore, thinking

styles profoundly influence how students perceive and process mathematical concepts and how they cope with problems (Krutetskii, 1976). In the context of mathematics education, this distinction is critical for understanding that students exhibit individual differences not only in their learning processes but also in their mathematical reasoning styles (Krutetskii, 1976; Borromeo Ferri, 2010).

The Importance of Individual Differences in Mathematics Education

Why is it so critical to focus on individual differences in mathematics teaching? Because traditional instructional methods tend to address only a single cognitive approach (Tomlinson, 2014). However, mathematical thinking is not limited to a single pathway (NCTM, 2000; Borromeo Ferri, 2018). At this point, Sternberg (2009) approaches thinking not merely as a cognitive process, but also as a matter of preference and style that reflects how individuals use their mental capacities. According to him, even individuals with similar mental abilities may differ significantly in the ways they perceive, organize, and interpret information. These differences lead to diversified needs in learning processes.

As Sternberg highlights, offering a single instructional model to students who organize information differently—even if they have "similar abilities"—may prevent some from realizing their potential, while causing others to experience mathematics anxiety. Individuals use their thinking styles and learning strategies to acquire new knowledge and reach learning goals (Çelik, 2016). While thinking has a significant role in learning and helps improve learning performance (Chen et al., 2011), the diversity in teachers' instructional practices greatly benefits students with different thinking styles (Dikmen et al., 2018). From an educational perspective, it can also be stated that teachers reflect their own thinking styles in their instructional processes (Doğan et al., 2020). Understanding thinking styles helps individuals make sense of why they adapt easily to some learning activities while struggling with others (Sternberg & Grigorenko, 1995). While research conducted with students shows that thinking styles play an important role in mathematics success (Çatalbaş, 2006; Sternberg, 1997; Zhang, 2004; Kaya, 2009), determining the thinking styles that make students mathematically strong or weak is of great importance in understanding and supporting their learning processes.

In contemporary educational systems, teachers—as guides in the learning process—need to know the pathways students follow while learning mathematics and which approaches facilitate learning. In this way, teachers can develop a deeper understanding of how mathematical knowledge is constructed, generalized, and enhanced in students' minds (Yeşildere, 2006). Helping students acquire qualified thinking styles and raising awareness about these styles is an educational necessity for enhancing their problem-solving abilities and their capacity to transfer these abilities to different problem situations (Emir, 2011).

Thinking styles also directly influence individuals' abilities to solve problems, adapt to their environment, and cope with changing conditions. Individuals with cognitive flexibility adapt more easily to change, whereas those with more rigid style preferences may struggle (Kozhevnikov, 2007). Ultimately, recognizing thinking styles in education and designing instructional strategies that embrace this diversity helps students fully realize their potential and increases the effectiveness of learning. The emphasis on considering individual differences in instruction also emerges in studies based on teachers' perceptions (Turgut et al., 2016). Teachers stated that they are aware of the cognitive differences among students, but that curricular pressures and a lack of knowledge make it difficult to fully reflect these differences in teaching. This demonstrates the importance of considering thinking styles in the teaching process for both teachers and students.

In conclusion, understanding and encouraging different thinking styles in a learning environment that considers individual differences in mathematics education is highly valuable for both teachers and students (Çelik, 2016). Because thinking style is a fundamental feature that affects the individual's behavior and problem-solving methods in every learning activity he or she participates in (Buluş, 2005).

Developing Style and Skill Together in Education

In the literature, thinking styles have been examined from various dimensions, and it is widely accepted that individuals can develop awareness and improve their styles (Sternberg, 1988; Grigorenko & Sternberg, 1997; Zhang & Sternberg, 2000). Among the most frequently analyzed constructs are cognitive styles, learning styles, and thinking styles. However, these concepts are often confused with "thinking skills." Yet style and skill are two different constructs. According to Sternberg (1997), skills refer to what individuals are capable of doing—their cognitive capacities and abilities—while style refers to how they use these skills, that is, the approach or pathway they prefer during thinking and problem solving.

The most critical distinction separating thinking styles from abilities and skills is that thinking style is not a capacity but a preference (Sternberg, 1997). People can possess multiple styles and use one or several depending on the situation. Style is not an absolute concept of "all or nothing," but rather a flexible set of preferences. Thinking styles are not labeled as right or wrong, good or bad; each represents an individual's unique approach to learning and thinking (Duru, 2004). For example, a student who is open to novelty and less bound by rules may perform poorly on multiple-choice tests but excel in open-ended or creative thinking tasks. This demonstrates that performance is not solely related to cognitive capacity, but also to the interaction between one's thinking style and the assessment format (Cano-García & Hughes, 2000).

Thinking styles are not fixed; they can change, differentiate, and diversify according to environmental factors, experiences, and developmental processes (Sternberg & Wagner, 1991). For instance, individuals whose abstract reasoning skills have not yet fully developed in childhood tend to prefer more concrete and

intuitive styles; as mental development progresses, they may shift toward more analytical or integrative thinking styles (Duru, 2004). Therefore, in education, it is important not only to improve students' thinking skills, but also to help them recognize their thinking styles and use different styles appropriately depending on the situation—an approach that supports cognitive flexibility.

Sternberg and Mental Self-Governance Theory

Among the studies on thinking styles, Sternberg's (1997) work is the most comprehensive, providing a theoretical foundation for the "Thinking Styles" framework based on the Theory of Mental Self-Government. In developing this theory, Sternberg (1988) used the concept of "government" as a metaphor. He likened the different ways individuals prefer to use their abilities to the ways societies govern themselves. Just as the structure of a government is not random, individuals—like societies—need to govern and organize themselves and their daily activities (Buluş, 2005; Sternberg, 1988). In this theory, the general characteristics of thinking styles are defined through 15 principles (Sternberg, 1997, pp. 79–98):

1.Styles are preferences in using abilities; they are not abilities themselves.

2.The harmony between style and ability creates synergy greater than the sum of its parts.

3.Life choices should align not only with abilities but also with styles.

4.Individuals possess a profile of styles, not a single style.

5.Styles vary according to tasks and situations.

6.Individuals differ in the strength of their style preferences.

7.Individuals differ in their stylistic flexibility.

8.Styles interact with socialization processes.

9.Styles diversify throughout the lifespan.

10.Styles can be measured.

11.Styles can be taught.

12.The value of a style depends on temporal conditions.

13.A style that is valuable in one situation may not be valuable in another.

14.Styles are not moderate, good, or bad.

15.Levels of ability are often confused with stylistic preferences (Dinçer, 2009).

Sternberg (1988), using the state as an analogy in his theory, discusses a total of 13 thinking styles, which he reduces to five different dimensions: functions, forms, levels, scope, and leaning (see Figure 1).

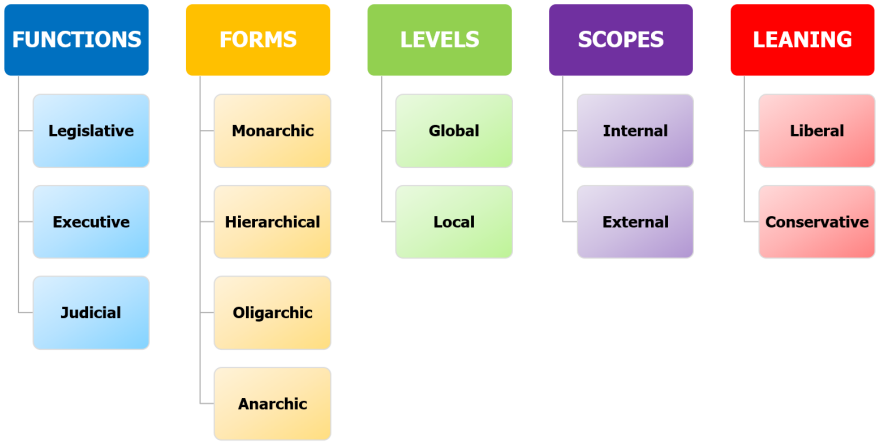


Figure 1. Sternberg's Theory of Mental Self-Management (Sternberg, 1988)

In the functional dimension, Sternberg (1988), emphasizing the three fundamental functions of the state: legislative, executive, and judicial, stated that individuals who organize their own activities, make their own choices without being directed by others, are uncomfortable with being directed, and tend to explore and produce original work possess a legislative thinking style. He stated that individuals who implement and carry out tasks assigned by others, rely on formulas when solving problems, and prefer to develop others' ideas rather than present their own, possess an executive thinking style. He stated that individuals who judge and compare their own and other individuals' activities and products possess a judicial thinking style.

When considering thinking styles formally, Sternberg (1988) categorized them into four basic forms. These are: monarchic, who can focus on a single goal alone; hierarchic, who can accomplish multiple tasks simultaneously by prioritizing multiple goals; oligarchical, who likes to multitask but cannot complete tasks because they cannot prioritize; and anarchic, who dislikes restrictive rules, processes, and formal systems but has a high potential for creative solutions when faced with a flexible attitude.

In the literature on students' thinking styles, holistic and analytic styles often appear. Sternberg (1988) conceptualized similar categories as global and local thinking styles within his level-based framework (Umay & Arıol, 2011). Individuals with a global thinking style tend to focus on the big picture and the overall situation, whereas those with a local thinking style enjoy engaging with details and prefer working with concrete problems over abstract ones.

Sternberg (1988) categorized thinking styles into internal and external according to their scope. He stated that individuals with an internal style enjoy working independently and prefer solitary work, while those with an external style prefer working with others and enjoy tasks requiring interpersonal interaction.

ISBN: 978-625-6959-98-9

Regarding tendencies, Sternberg (1988) noted that individuals with a conservative thinking style avoid new approaches, adhere to existing rules, and use previously tested methods when completing a task. In contrast, individuals with a liberal thinking style enjoy improving existing rules and processes, are open to change, and do not hesitate to explore new approaches in uncertain situations.

Dimensions and Styles of the Thinking Styles Inventory

The Thinking Styles Inventory, designed by Sternberg and Wagner (1992) to measure 13 thinking styles, is a self-report questionnaire that asks individuals about their preferences in various situations. The inventory was translated into Turkish and validated by Buluş (2006).

Table 1. *Dimensions and Style Types of the Thinking Styles Inventory (Sternberg, 1988)*

Dimension	Style	Definition
Functions	Legislative	Prefers to set own rules, develop original methods, and work with creative, unstructured tasks.
	Executive	Follows existing rules and guidelines; adapts to clear instructions and structured tasks.
	Judicial	Enjoys analyzing, critiquing, and evaluating rules, ideas, and processes
Forms	Hierarchical	Organizes multiple tasks by prioritizing goals; approaches complex objectives systematically.
	Oligarchic	Attempts to handle several equally important tasks simultaneously; may struggle to differentiate priorities.
	Monarchic	Focuses on a single goal and makes a concentrated effort to complete that task.
	Anarchic	Prefers flexible, unstructured approaches; often generates creative and unconventional solutions.
Levels	Global	Prefers seeing the big picture and working with general principles; dislikes dealing with details.
	Local	Focuses on details; successful with concrete, hands-on, and practical tasks.
Scope	Internal	Prefers independent work, individual thinking, and personal productivity.
	External	Prefers social interaction, teamwork, and collaborative tasks.

Leanings	Conservative	Prefers existing rules, traditional methods, and structured tasks; resistant to change
	Liberal	Enjoys trying innovative and unconventional ideas; comfortable with ambiguity and new methods.

The Thinking Styles Inventory is an important tool for identifying students' individual differences in information processing, problem solving, and approaches to learning. It helps teachers diversify classroom activities and assessment methods, thereby enabling students with different thinking styles to engage more effectively in the learning process (Sternberg & Grigorenko, 1997; Sternberg & Wagner, 1992). Additionally, by helping students recognize their own cognitive preferences, the inventory supports learner autonomy and self-regulation skills. In this sense, it contributes to the design of inclusive and flexible learning environments (see Table 2).

Table 2. *Areas of Use of the Thinking Styles Inventory in Education*

Areas of Use	Explanation
Understanding individual differences	Helps explain why students respond differently to the same content and differences in coursework and assignment performance
Diversifying instructional strategies	It allows for the diversification of teaching activities based on the different styles employed in the classroom. For example, projects can be designed for legislators, conceptual summaries for the global style, and practical activities for the local style.
Assessment variety	In addition to multiple choice tests, it offers opportunities to suit every style with different assessment types such as projects, essays, portfolios, and group work.
Developing self-awareness	It helps students and teachers identify their own thinking styles, helping them enhance their strengths and improve their weaknesses
Creating inclusive learning environments	It helps develop a more equitable, inclusive, and holistic teaching approach by providing learning experiences tailored to different styles.

Harrison and Bramson's Thinking Styles Approach

Harrison and Bramson (1984) referred to thinking styles as Inquiring Modes, defining them as purposeful sets of methods individuals use to make sense of the world. These modes are grounded in early-developed personal preferences, learned values, and individuals' constructed understanding of reality.

Five Fundamental Thinking Styles

Harrison and Bramson (1984) identified five major thinking styles in Western cultures. Individuals typically show strong tendencies toward one or two of these styles. Their InQ (Inquiring Modes Questionnaire) measures the extent to which individuals lean toward each style. These styles—synthesist, idealist, pragmatist, analyst, and realist—are presented in Table 3 in the context of mathematics education.

Table 3. *Harrison & Bramson's Five Thinking Styles Adapted for Mathematics Education (Chao & Huang, 2002)*

Thinking Style	Definition in Mathematics Context
Synthesist	Establishes unexpected relationships between different mathematical ideas and produces creative, versatile, and alternative solutions.
Idealist	It attaches importance to ideal forms of mathematical concepts, precise definitions, and conceptual integrity; it is focused on accuracy and consistency.
Pragmatist	It focuses on using mathematical knowledge in everyday life contexts and tends to model, apply, and develop practical solutions.
Analyst	Prefers step-by-step, systematic, and evidence-based solution processes; procedural accuracy and logical order are at the forefront.
Realist	Prefers to make problems concrete, work directly with data, and determine a single, definitive solution; seeks clarity and certainty.

Giving adequate importance to thinking styles strengthens individuals' communication and problem-solving abilities. According to Kienholz (1999), effective use of knowledge requires considering how people collect information, ask questions, and make decisions. Thus, the InQ questionnaire is a useful tool for identifying individuals' thinking tendencies and organizing learning processes accordingly (Harypursat, 2005).

Krutetskii's Structures of Mathematical Thinking

Krutetskii (1976), arguing that mathematical ability varies not only in terms of level but also in terms of thinking structures and the ways students choose to think during problem-solving, classified students' mathematical thinking styles into three basic structures: analytical, geometric, and harmonic

thinking structures. This classification is based on students' tendency to use verbal-logical and visual-pictorial components during problem solving.

Students with an analytic thinking structure can easily process abstract mathematical expressions and schemas. Even when problems include visual elements, they do not need diagrams or objects; they analyze relationships directly at an abstract level (Presmeg, 1986; Delice & Taşova, 2012).

Students with a geometric thinking structure possess strong visual-figurative mental components. They need visual representations to understand abstract relationships and are successful in creating these representations. However, they may struggle when they cannot produce the necessary diagrams (Hacıömeroğlu et al., 2014).

Harmonic thinkers exhibit a balanced use of verbal-logical and visual-figurative components. While capable of interpreting abstract relationships visually, their visual representations typically follow verbal-logical analysis. They tend to use both analytic and geometric strategies in problem solving (Taşova, 2011).

Krutetskii's classification highlights the diversity of mathematical thinking, demonstrating that students differ in their preferred representations, strategies, and cognitive pathways during problem solving (Krutetskii, 1976).

Borromeo Ferri's Classification of Mathematical Thinking Styles

In mathematics education research, cognitive abilities were historically used to explain differences in students' mathematical performance (Zhang, 2001; Wang & Tseng, 2015). However, more recent studies show that such differences are related not only to "how intelligent" students are but also to "how they use their intelligence"—that is, their thinking styles (Wang & Tseng, 2015). Mathematical thinking styles are not about how well a person understands mathematics; they reflect the characteristic approach a person uses while learning and understanding mathematics (Borromeo Ferri, 2012, 2015). This perspective shifts the framing of difficulties from "deficiency" to "mismatch," encouraging diversified instructional strategies.

Borromeo Ferri (2015) developed his conceptual framework for mathematical thinking styles based on Sternberg's (1997) fundamental definition: "A thinking style is not an ability, but a way of thinking." Similarly, Borromeo Ferri (2015) defines mathematical thinking styles as an individual's approach to learning and understanding mathematics. Borromeo Ferri's (2015) study, based on empirical findings, revealed that students' mathematical thinking styles differ significantly from one another and classified these differences under three basic mathematical thinking styles: visual, analytical, and integrated. This model demonstrates that mathematical thinking is not only a cognitive process but also closely related to individuals' preferred representations, strategies, and reasoning styles. Some studies have also emphasized the intuitive style, stating that this style predominates in situations where students tend to explore based on their experience and insights (Huincahue, 2021).

Visual Mathematical Thinking Style

Students with a visual mathematical thinking style tend to use mental images, shapes, diagrams, and visual models when processing mathematical concepts, relationships, and problems. They organize information spatially and holistically. For example, they prefer to focus on the graph of a function rather than its algebraic formula to understand it, and they prefer to use mental visualizations to solve a geometric problem. These students may struggle with abstract and symbolic expressions where visualization is limited; however, their strength lies in their ability to recognize the structural features of a problem and see the "big picture." A visual thinking style is particularly advantageous in tasks requiring geometry, modeling, and spatial reasoning.

Analytic Mathematical Thinking Style

The analytical thinking style involves approaching mathematical processes in a sequential, logical, step-by-step manner. Students who prefer this style process information linearly through language, symbols, and formulas. They may excel at systematic processes such as solving equations, differentiation and integration, or mathematical proof. Analytical thinkers enjoy following rules and following a specific solution path. However, these students may sometimes struggle to transition between different representations or make intuitive inferences. This stems from their emphasis on accuracy and systematicity in the solution process.

Integrated Mathematical Thinking Style

One of the most striking findings of Borromeo Ferri's (2015) study is that a significant portion of students possess an integrated thinking style. Students with this style can flexibly combine visual and analytical thinking styles. They can select the most appropriate representation and strategy based on the nature of the problem and context, transitioning from a visual representation to an analytical solution or from a symbolic representation to a visual model as needed. This flexibility in transition provides a significant advantage in problem-solving and is often associated with deeper conceptual understanding. The integrated style fosters students' cognitive flexibility, diversity of representations, and the ability to connect different ways of thinking.

Borromeo Ferri's classification provides a powerful framework for understanding the diversity observed in mathematics classrooms. This model conveys the following critical messages to teachers:

a. Recognizing Diversity: Students with these three thinking styles coexist in every classroom. This emphasizes that teachers should not assess students based on a single way of thinking. Understanding why students think differently is valuable for supporting their learning processes, rather than categorizing them.

b. Diversifying Instruction: Instruction based solely on formulas, symbols, and procedures (which appeal to analytical styles) can disadvantage students

with a visual thinking tendency. Similarly, instruction exclusively based on visual representations can hinder the conceptual depth of analytical students. Effective teaching requires a balanced use of diverse representations, taking into account the strengths of both styles.

c. Encouraging Integrated Thinking: One of the fundamental goals of mathematics instruction is to ensure that students develop competence in both visual and analytical thinking styles and that they can use these thinking styles flexibly depending on the situation. Therefore, each mathematical concept should be presented through multiple representations (verbal, visual, symbolic), and activities should be included that allow students to transition between these representations.

Table 4. *Problem-Solving Approaches According to Mathematical Thinking Styles (Adapted from Borromeo Ferri's Theory of Mathematical Thinking Styles)*

Thinking Style	Student's Approach (Problem-Solving Process)	Emphasis / Cognitive Characteristics
Analytic Thinking Style	• Sees the problem as a "system of two equations with two unknowns." • Defines variables: chicken = c, sheep = s • Forms equations: Number of heads: c + s = 30 Number of legs: 2c + 4s = 80 • Solves by substitution: c = 30 – s → 2 (30 – s) + 4s = 80 → s = 10, c = 20 • Justifies the result in a logical sequence.	Logical, sequential, symbolic thinking. Step-by-step progression, rule-based reasoning.
Visual Thinking Style	• Mentally visualizes the problem with the assumption: "If all animals were chickens…" • Calculates: 30 × 2 = 60 legs • Finds the difference: 80 – 60 = 20 legs • Interprets the difference: Each sheep has 4 – 2 = 2 extra legs. • 20 / 2 = 10 sheep, 30 – 10 = 20 chickens. • Mentally visualizes shapes and quantİ-tative relationships during the solution process.	Visualization, intuitive relation-making, and concrete modeling. Ability to see the 'big picture.'
Integrated Thinking Style	• Produces an analytical solution: c + s = 30, 2c + 4s = 80 → c = 20, s = 10 • Then checks it visually: 20 chickens (40 legs) + 10 sheep (40 legs) = 80 • Or vice versa: first finds the answer visually, then verifies it using algebraic equations.	Flexibility, use of multiple representations, and the ability to switch between analytic and visual strategies.

Borromeo Ferri's model tells teachers the following:

- Mathematical "success" does not mean simply following the analytic-algebraic path.
- A student who arrives at the correct conclusion through visual means (diagrams, drawings) demonstrates at least as deep a mathematical understanding as an analytic student.
- The goal of instruction is not to force students into a single style (usually analytic), but to allow them to recognize their natural tendencies

(styles) and ultimately encourage them to develop an integrated thinking style, that is, cognitive flexibility.

In conclusion, Borromeo Ferri's mathematical thinking style model offers a strong cognitive foundation for improving the quality of mathematics instruction. Recognizing students' cognitive diversity, creating multi-representative learning environments, and encouraging flexible thinking stand out as fundamental approaches that deepen mathematical understanding and enhance students' problem-solving skills.

Implications and Conclusion in Mathematics Education

The studies of researchers such as Krutetskii (1976) and Borromeo Ferri (2012, 2015) on mathematical thinking styles enable us to question deeply rooted assumptions about mathematics education and provide a rich framework for pedagogical practices. Based on this framework, the main implications and conclusions can be summarized as follows:

The Necessity of a Transition from a Single-Size to a Multi-Dimensional Instruction

The most significant conclusion from the work of both researchers is that a one-size-fits-all teaching method is inherently limited and inequitable. Traditional mathematics education generally adopts a formula- and algorithm-focused approach that centers on an analytical/sequential thinking style. This disadvantages students with visual styles, obscuring their strengths of spatial reasoning and holistic perception. Therefore, an effective and inclusive mathematics classroom should systematically incorporate both visual and analytical representations (diagrams, graphs, manipulatives, symbolic representations, verbal explanations). Teachers must be skilled at presenting the same concept in multiple ways that are accessible to students with different learning styles.

Reinterpreting Student Success and Struggle

A student's difficulty with a particular mathematical subject should not automatically be interpreted as a sign of "incompetence" or "laziness." Studies by Krutetskii and Borromeo Ferri demonstrate that this difficulty can often stem from a mismatch between teaching style and the student's thinking style. A visual learner may struggle with abstract algebra, while the same student may excel in geometry or statistics. This perspective encourages teachers to address the root causes of students' difficulties and offer them alternative learning strategies that align with their thinking styles.

Promoting Flexible Thinking

Borromeo Ferri's emphasis on the "integrated style" suggests that one of the ultimate goals of mathematics education is to develop a flexible mathematical thinking structure in students. Real-world problems cannot be solved strictly using only visual or analytical approaches. Therefore, curriculum

and classroom activities should challenge students to switch between different representations when working on a problem. For example, activities such as providing the graph of a function and having them find its algebraic rule, or having them first model a word problem diagrammatically and then solve it, will strengthen integrated thinking skills.

Diversify Assessment Methods

If students learn in different ways, they need different ways to demonstrate what they know and can do. Standardized multiple-choice or short-answer tests that focus solely on getting the answer right often reward an analytical/executive thinking style. A fair assessment should include a variety of methods through which students can demonstrate their understanding. This could include formats such as open-ended projects, modeling, poster presentations, visualization of a solution process, or comparison of different solution approaches.

Transforming Teacher Education

Pre-service and in-service teacher training should teach prospective teachers and practitioners not only mathematical content but also the theory of thinking styles and how to reflect this in classroom practice. Teachers' awareness of their own thinking styles and observing how this is reflected in their teaching practices is the first step toward creating a more equitable and inclusive learning environment in their classrooms.

Conclusion

Sternberg is the most important theorist who distinguished the concept of talent (intelligence) from the concept of style (Sternberg, 1997). Influenced by Sternberg's Mental Self-Governance Theory, Borromeo Ferri directly applied this philosophy, built on the foundations that distinguish style and ability, to mathematics education. This chapter emphasizes that individual differences in mathematics learning go beyond the myth of innate "mathematical intelligence" and that students' analytical, visual, and integrated thinking styles offer different but equivalent ways to understand mathematical concepts. Based on the mathematical thinking styles initially developed by Krutetskii (1976), Sternberg's theory of mental self-governance, and Borromeo Ferri's mathematical thinking style model (Borromeo Ferri, 2004, 2018), it has been concluded that these styles are not a ranking of competences but rather an indicator of cognitive diversity.It has been argued that the frequent focus of mathematics instruction on a single style (analytical-symbolic) obscures the potential of students with diverse styles. Therefore, instructional processes should be restructured with the principles of multiple representation, flexible assessment, and cognitive flexibility. It has been suggested that thinking styles should not be used as a labeling tool, but rather as a tool to support each student's recognition of their own cognitive pathways and their experimentation with other styles. Consequently, recognizing thinking styles offers teachers the opportunity to move from asking "who can't do it" to "who thinks how," paving the way for an inclusive and flexible pedagogical approach in mathematics instruction.

ISBN: 978-625-6959-98-9

The goal of mathematics instruction is not simply to find the right answer, but to manage a process in which each student discovers, develops, and enriches their own way of thinking. This is only possible with an educational approach that understands the nature of thinking styles and diversifies instruction accordingly (Zhang & Sternberg, 2009; Borromeo Ferri, 2018).

REFERENCES

Borromeo Ferri, R. (2004). Mathematical thinking styles and word problems. *Pre-conference proceedings of the ICMI Study*, 14, 47–52.

Borromeo Ferri, R. (2010). On the influence of mathematical thinking styles on learners' modeling behavior. *Journal für Mathematik-Didaktik, 31*(1), 99–118. https://doi.org/10.1007/s13138-010-0009-8

Borromeo Ferri, R. (2012). Mathematical thinking styles and their influence on teaching and learning mathematics. Paper presented at the 12th International Congress on Mathematical Education, Seoul, Korea.

Borromeo Ferri, R. (2015). Mathematical thinking styles in school and across cultures. In *Selected regular lectures from the 12th International Congress on Mathematical Education*. Springer. https://doi.org/10.1007/978-3-319-17187-6_9

Borromeo Ferri, R. (2018). Mathematical thinking styles. In G. Kaiser (Ed.), *PME series: Research on mathematics teaching and learning*. Springer.

Buluş, M. (2005). The investigation of the thinking styles profile of students in the department of elementary education. *Ege Journal of Education, 6*(1), 1–24.

Buluş, M. (2006). Assessment of thinking styles inventory, academic achievement and student teacher's characteristics. *Eğitim ve Bilim, 31*(139), 35–48.

Cano-García, F., & Hughes, E. H. (2000). Learning and thinking styles: An analysis of their interrelationship and influence on academic achievement. *Educational Psychology, 20*(4), 413–430. https://doi.org/10.1080/713663755

Chao, L., & Huang, J. (2002). Thinking styles of school teachers and university students in mathematics. *Psychological Reports, 91*, 931–934.

Çatalbaş, E. (2006). The relation between academic success and lesson manner of thinking style of high school students (Unpublished master's thesis). Selçuk University, Social Sciences Institute.

Çelik, D., & Kumral, O. (2016). Thinking styles of grade 11th students, learning strategies and the relationship between learning strategies and thinking style. *Mersin University Journal of the Faculty of Education, 12*(2).

Chen, N. S., Wei, C. W., & Liu, C. C. (2011). Effects of matching teaching strategy to thinking style on learner's quality of reflection in an online learning environment. *Computers & Education, 56*(1), 53–64.

Delice, A., & Taşova, H. İ. (2012). An investigation of mathematics teacher trainees' modelling skills based on their thinking structures. *Sakarya Üniversitesi Eğitim Fakültesi Dergisi, 24*, 24–40.

Dikmen, M., Şimşek, M., & Tuncer, M. (2018). The relationship between learning styles and attitudes toward learning. *The Journal of International Social Research, 11*(57), 388–400.

Dinçer, B., & Saracaloğlu, A. S. (2011). The investigation of teacher candidates' thinking style profiles in terms of various variables. *The Journal of Turkish Educational Science, 9*(4), 701–744.

Doğan, D., Demir, Ö., & Çınar, M. (2020). Thinking styles and the place of thinking styles in education. In D. G. Akıncı (Ed.), *Educational technology readings 2020* (1st ed., Chapter 14). Pegem Akademi. https://doi.org/10.14527/9786257228626

Duru, E. (2004). The relationship between empathy and helping tendency among pre-service teachers and an examination of helping tendency in terms of certain psychosocial variables. *Pamukkale University Journal of Education Faculty, 15*, 45–60.

Emir, S. (2011). An examination of thinking styles in terms of different variables. *Hasan Ali Yücel Journal of Education Faculty, 15*(1), 77–93.

Entwistle, N. J. (1978). Knowledge structures and styles of learning: A summary of Pask's recent research. *British Journal of Educational Psychology, 48*(3), 255–265.

Hacıömeroğlu, G., Hacıömeroğlu, E. S., Güzel, E. B., & Kula, S. (2014). Visual, analytic, and harmonic solution preferences in solving derivative and integral problems. *Dicle University Ziya Gökalp Journal of Education Faculty, 22*, 108–119.

Harrison, A. F., & Bramson, R. M. (1984). *The art of thinking*. Berkley Publishing Group.

Harypursat, R. (2005). The thinking styles of IT students and practitioners (Unpublished master's thesis). University of KwaZulu-Natal.

Huincahue, J., Borromeo-Ferri, R., Reyes-Santander, P., & Garrido-Véliz, V. (2021). Mathematical thinking styles—The advantage of analytic thinkers when learning mathematics. *Education Sciences, 11*(6), 289. https://doi.org/10.3390/educsci11060289

Kaya, B. (2009). An examination of 6th, 7th, and 8th grade students' thinking styles and mathematics achievement in terms of various variables (Unpublished master's thesis). Yıldız Technical University, Institute of Social Sciences.

Kienholz, A. (1999). *Systems rethinking: An inquiring systems approach to the art and practice of the learning organisation*. http://wwwcba.uh.edu/~parks/fis/fisart.htm

Kolb, D. A. (1976). *The learning style inventory: Technical manual*. McBer.

Kolb, D. A., Boyatzis, R. E., & Mainemelis, C. (2001). Experiential learning theory: Previous research and new directions. In R. Sternberg & L. Zhang (Eds.), *Perspectives on cognitive, learning, and thinking styles*. Lawrence Erlbaum Associates.

Kozhevnikov, M. (2007). Cognitive styles in the context of modern psychology: Toward an integrated framework of cognitive style. *Psychological Bulletin, 133*(3), 464–481. https://doi.org/10.1037/0033-2909.133.3.464

Krutetskii, V. A. (1976). *The psychology of mathematical abilities in schoolchildren*. University of Chicago Press.

National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics*. NCTM.

Presmeg, N. C. (1986). Visualization in high school mathematics. *For the Learning of Mathematics, 6*(3), 42–46.

Riding, R. J., & Rayner, S. G. (2000). *Cognitive styles*. Ablex Publishing.

Sternberg, R. J. (1988). Mental self-government: A theory of intellectual styles and their development. *Human Development, 31*(4), 197–224. https://doi.org/10.1159/000276315

Sternberg, R. J. (1994). Thinking styles: Theory and assessment at the interface between intelligence and personality. In R. J. Sternberg & P. Ruzgis (Eds.), *Personality and intelligence* (pp. 169–187). Cambridge University Press.

Sternberg, R. J. (1997). *Thinking styles*. Cambridge University Press. https://doi.org/10.1017/CBO9780511584152

Sternberg, R. J., & Grigorenko, E. L. (1995). Styles of thinking in the school. *European Journal for High Ability, 6*, 201–219.

Sternberg, R. J., & Wagner, R. K. (1992). *Thinking Styles Inventory* [Unpublished test].

Taşova, H. İ. (2011). Examination of preservice mathematics teachers' thinking and visualization skills during modelling activities and performance (Unpublished master's thesis). Marmara University.

Tomlinson, C. A. (2014). *The differentiated classroom: Responding to the needs of all learners*. ASCD.

Torrance, E. P., & Rockenstein, Z. L. (1988). Styles of thinking and creativity. In R. R. Schmeck (Ed.), *Learning strategies and learning styles* (pp. 275–290). Plenum Press.

Turgut, Ü., Salar, R., Aksakallı, A., & Gürbüz, F. (2016). An investigation of teachers' perspectives on the reflection of individual differences in the teaching process: A qualitative study. *Bayburt Journal of Education Faculty, 11*(2).

Umay, A., & Arıol, Ş. (2011). A comparison of problem-solving skills in terms of holistic and analytical thinking styles. *Pamukkale University Journal of Education, 30*, 27–37.

Wang, T. L., & Tseng, Y. K. (2015). Do thinking styles matter for science achievement and attitudes toward science class in male and female elementary school students in Taiwan? *International Journal of Science and Mathematics Education, 13*(3), 515–533.

Yeşildere, S. (2006). The investigation of mathematical thinking and knowledge construction processes of primary 6, 7 and 8th grade students who have different mathematical power (Unpublished doctoral dissertation). Dokuz Eylül University.

Zhang, L. F. (2001). Relationship between Thinking Styles Inventory and Study Process Questionnaire. *Personality and Individual Differences, 29*, 841–856.

Zhang, L. F. (2002). Thinking styles and cognitive development. *The Journal of Genetic Psychology, 163*(2), 179–195. https://doi.org/10.1080/00221320209598676

Zhang, L. F. (2004). Thinking styles: University students' preferred teaching styles and their conceptions of effective teachers. *The Journal of Psychology, 138*(3), 233–252. https://doi.org/10.3200/JRLP.138.3.233-252

Zhang, L. F., & Sternberg, R. J. (2000). Are learning approaches and thinking styles related? A study in two Chinese populations. *The Journal of Psychology, 134*(5), 469–489.

Zhang, L. F., & Sternberg, R. J. (2005). A threefold model of intellectual styles. *Educational Psychology Review, 17*(1), 1–53. https://doi.org/10.1007/s10648-005-1635-4

Zhang, L. F., & Sternberg, R. J. (2009). *The nature of intellectual styles*. Lawrence Erlbaum Associates. https://doi.org/10.4324/9780203842733

ABOUT THE AUTHORS

Zeynep Gürsoy is a PhD candidate in Mathematics Education at Hacettepe University. She aims to look at mathematics education from different perspectives and understand students' ways of thinking.

Zeynep Sonay Ay is an educator and researcher in the field of mathematics education at Hacettepe University. Her scholarly work focuses on mathematical thinking processes, algebra and number teaching, problem solving, proof and proving, as well as self-regulation skills in teacher education.

Similarity Index

The similarity index obtained from the plagiarism software for this book chapter is 9%.

To Cite This Chapter:

Gürsoy, Z. & Ay, Z.S. (2025). Individual Differences in Learning Mathematics: A Perspective Through Thinking Styles. In O. Çardak (Ed.), *Current Studies in Educational and Social Sciences 2025* (pp. 26-43). ISRES Publishing.

SCHOOL GARDENS AS OUT-OF-SCHOOL LEARNING ENVIRONMENTS FOR SCIENCE EDUCATION

Ramazan ŞAHİN
Ballı Ortaokulu, Hizan
E-mail: sramazan914@gmail.com
ORCID: 00090-0008-3788-6075

Nuriye KOÇAK
Necmettin Erbakan University
E-mail: nuriye42@gmail.com
ORCID: 0000-0002-0531-3538

Kadriye KAYACAN
Necmettin Erbakan University
E-mail: kadriyekayacan@gmail.com
ORCID: 0000-0003-1531-6991

Introduction

From the first days of opening their eyes to the world, individuals engage in cognitive activities such as observing and wondering about their immediate surroundings, and they remain in a continuous learning process throughout their lives. From an early age, individuals exhibit a sensitivity to statistical regularities present in their environment and demonstrate the ability to recognize and retain the patterns they encounter. Furthermore, infants employ this information to construct predictive representations of their surroundings and possess the capacity to continuously and flexibly revise these representations in response to novel data (Hunnius, 2022). This process represents a dynamic mechanism through which individuals acquire new knowledge, competencies, attitudes, and values as a result of their experiences, whether consciously or unconsciously. Learning is not just an event that takes place in school environments; it is a multidimensional process that continues at all times within the family, among friends, in social environments, and in interaction with nature. In this context, education can be defined as a process that encompasses formal, informal, and non-formal learning forms and aims to create behavioral change in both individuals and others. While formal education refers to structured teaching conducted within the school setting, informal education occurs outside the school without a predetermined plan, whereas non-formal education involves organized learning experiences that take place beyond the school environment under the supervision of a facilitator or mentor. Today, student-centered approaches are becoming increasingly

important in educational processes. This situation paves the way for the spread of out-of-school learning approaches that go beyond classroom walls and encourage active student participation, discovery, and experiential learning (Bakioğlu and Karamustafaoğlu, 2020; Karslı and Kurt, 2022; Şahin and Asal Özkan, 2023). It has been emphasized that such out-of-school activities should be planned by the educator, forming a bridge between learning outcomes and the environment, and should be educational in nature (Eshach, 2007). Table 1 shows the differences between formal, non-formal, and informal education.

Tablo 1. *Differences between Formal, Non-formal and Informal learning (Eshach, 2007).*

Formal	Non-formal	Informal
Usually at school	At institution out of school	Everywhere
May be repressive	Usually supportive	Supportive
Structured	Structured	Unstructured
Usually prearranged	Usually prearranged	Spontaneous
Motivation is typically more extrinsic	Motivation may be extrinsic but it is typically more intrinsic	Motivation is mainly intrinsic
Compulsory	Usually voluntary	Voluntary
Teacher-led	May be guide or teacher-led	Usually learner-led
Learning is evaluated	Learning is usually not evaluated	Learning is not evaluated
Sequential	Typically non-sequential	Non-sequential

These differences between formal, non-formal and informal learning forms show that learning does not only take place in the school environment; on the contrary, learning continues in every interaction the individual has with his/her environment. The most striking feature of out-of-school learning is that it takes place outside of school, students are interested, willing, active and provide permanent learning by appealing to a large number of sensory organs. In addition, out-of-school learning provides the opportunity to concretize abstract information, to learn with pleasure and to use what is learned in daily life (Armağan, 2015). When looking at the literature, various terms are used for learning environments outside school walls, such as “free-choice learning,” “lifelong science learning,” “science learning in everyday life,” “science learning in everyday life,” “out of school,” and “Learning Outside of the Four Walls” (Dierking et al., 2003). The names suggest a great deal of diversity. However, the ultimate goal is for learning to be motivating and engaging, in line with individuals' interests and needs (Rennie et al., 2003).

0.1. Out-of-School Learning Environments

People in prehistoric times shared their knowledge and skills with each other in order to survive. The fact that they had to carry out the necessary practices in natural environments, as there were no school environments as we know them today, suggests that learning outside of school is as old as human history (Erol Işıklı, 2023). With the aim of improving the quality of education and increasing lasting learning, teaching outside of school was first implemented at a school called “Broadoks School” in the USA, which was established to care for orphaned children. The inventors of the practice initially proposed the idea of using nature as a laboratory in lessons. The founders of the school, Ada Imelda Brooks and her sister, first developed this technique as an out-of-school teaching method during these years, and it was included in the California state curriculum in 1912 (Okul-Berberoğlu and Uygun, 2013).

Similarly, the migratory lifestyle of the Turks prevented the establishment of school institutions for many years. However, they utilized their natural environments to learn skills such as warfare, horseback riding, and hunting through hands-on experience (Metin, 2020). This situation demonstrates that out-of-school learning environments also have a deep-rooted history in Turkish history. It is important for students to be able to use the knowledge and skills they learn at school in non-school learning environments. Non-school learning environments include learning experiences that take place outside the school setting. Figure 1 details the learning environments. The locations where non-formal and informal learning environments occur are indicated in Figure 1 according to Eshach (2007).

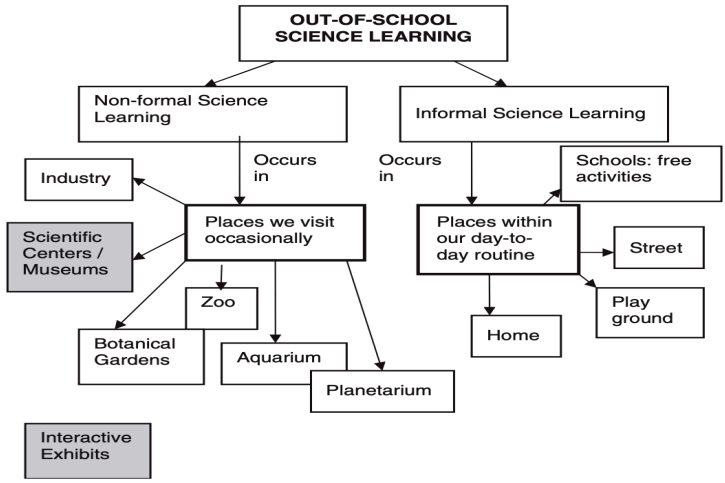


Figure 1. *Non- formal and informal learning (Eshach, 2007).*

Schools are places where social needs are met in addition to education and teaching. Education, teaching, and socialization can take place not only within school boundaries but also outside of school. Out-of-school education is a system where regular, systematic, and active participation is ensured, and learning is enjoyable (Baygül, 2023). Out-of-school learning is utilized in many disciplines in education. How educational and teaching activities will be carried out and evaluated in out-of-school learning environments is planned within the framework of teaching programs. Programming has a huge impact on instilling targeted behaviors and achieving success (Atmaca, 2021). Teaching programs include all activities related to the teaching of a subject at school or outside of school. The educational program is the most comprehensive and includes the teaching program (Demirel, 2020). Empirical studies conducted within out-of-school learning contexts indicate that such experiences exert positive and enduring influences on students. These influences are generally categorized as long-term impacts and learning-enhancing outcomes. From a long-term perspective, participation in out-of-school learning activities has been shown to foster sustained cognitive and social development. Moreover,

with regard to learning enhancement, these experiences offer substantial educational gains by promoting active engagement and reinforcing conceptual understanding(Anderson et al., 2006; Laçin Şimşek, 2011).

0.1.1. Outdoor Learning

Today, advances in technology and increasing urbanization are reducing the amount of time children spend in nature. The lack of outdoor spaces in cities and the fact that children spend a lot of time with technological devices increase the need for environments that contain natural elements. Doctors and psychologists commonly agree that children who spend more time indoors experience negative effects on their mental, physical, and social development (Yılmaz and Bulut, 2002). Considering not only children's mental, physical, and social development but also their physical health, the importance of outdoor activities is increasing day by day. According to the World Health Organization (WHO), young children should be given opportunities to participate in a wide range of developmentally appropriate, safe, and enjoyable play-based physical activities. Furthermore, the WHO recommends that children should engage in a total of at least three hours of physical activity of varying intensities throughout the day. Additionally, the report highlights empirical evidence demonstrating that regular physical activity contributes positively to cognitive, psychosocial, metabolic, and musculoskeletal health outcomes (WHO, 2019). Children who do not spend enough time outdoors, do not interact with nature, and spend their time engaged in indoor activities such as watching television, using phones, or tablets are increasingly becoming disconnected from nature. Therefore, it has become important for children to be in educational environments that incorporate natural elements. Outdoor education enables students to fully utilize their cognitive, affective, and psychomotor skills, makes their learning experiences enjoyable, and contributes to their learning outcomes (Nundy, 1999). One of the common findings of many studies conducted on outdoor education is that it improves students' social relationships. Through outdoor education, students can develop effective learning skills, establish strong social relationships at school and in social life, improve their planning and implementation skills, and increase their confidence in their environment (Man et al., 2022).

In recent years, outdoor learning has attracted increasing attention as a means to enhance educational experiences, promote school engagement, and support the health and well-being of students(Marchant et al., 2019). Outdoor learning has been found to positively affect student participation and academic achievement. Research has shown that regular outdoor learning as part of the curriculum increases student participation in class (Marchant et al., 2019). Experiential outdoor education for middle school students has a positive effect on student motivation and educational gains. Furthermore, studies show that outdoor learning supports the development of attention skills in children, as well as cognitive and physical development (McCree et al., 2018).

Engaging in physical activities within natural environments contributes to the enhancement of mobility, physical fitness, and the development of

motor skills (Edwards et al., 2016). In this regard, outdoor learning offers children valuable opportunities to establish a connection with nature while simultaneously fostering a sense of freedom and enjoyment. (Tal et al., 2014). Furthermore, outdoor learning has been recognized to have positive effects on mental health, well-being, and physical literacy (Mann et al., 2021). Outdoor learning provides opportunities for developing fundamental skills. Through engagement in creative and problem-based learning activities, children can enhance their creativity, critical thinking, and problem-solving abilities. Outdoor education programs have been shown to develop psychomotor skills, social interactions, and teamwork skills in students (Tal et al., 2014).

Outdoor learning has the potential to reduce educational inequalities and close the achievement gap. Research on an outdoor learning program based on a structured curriculum called "Wilderness Schooling" has shown that, compared to traditional schooling, outdoor learning also contributes significantly to gains in English reading, writing, and mathematics (Quibell et al., 2017). By providing alternative contexts for education and offering experiential learning opportunities, outdoor learning can create more equitable learning environments. In conclusion, outdoor learning offers numerous benefits for students, schools, and communities. It increases academic engagement, supports health and well-being, develops essential skills, and contributes to reducing educational inequalities.

0.1.2. Examining Outdoor Learning in the Context of Students and Teachers

Numerous studies so far have explored how outdoor education programs impact students, offering insights into the advantages of learning within natural settings. For example, a systematic review by Becker et al. (2017) indicated that regularly conducted outdoor education programs yielded positive results in students' social, learning, and physical activity dimensions. James and Williams (2017), in their work, highlighted the positive effects of outdoor education on student participation and learning motivation, emphasizing the importance of incorporating this type of education into the school curriculum.

Research shows that outdoor learning experiences can enhance students' critical thinking, creativity, and problem-solving skills. Students who learn outdoors have demonstrated improved performance on standardized tests and increased creative thinking skills. Furthermore, outdoor learning experiences provide students with opportunities to develop social skills, teamwork skills, and a sense of environmental stewardship (Dyment, 2005, Yli-Panula et al., 2019). The benefits of outdoor learning extend beyond academic outcomes, including promoting active citizenship, reducing crime, and preventing antisocial behavior (Eigenschenk et al., 2019).

Teachers play a crucial role in implementing outdoor learning. Research shows that teachers perceive outdoor learning as a pedagogical approach that increases student participation and learning outcomes. Outdoor learning offers teachers opportunities to adopt innovative teaching methods, co-construct knowledge with students, and create meaningful learning experiences.

Furthermore, participating in outdoor education also provides professional development opportunities that allow teachers to enhance their environmental knowledge and teaching skills (Marchant et al., 2019; Thomas, 2015; Lugg & Slattery, 2003).

In conclusion, outdoor learning offers various opportunities for both students and teachers. It increases student participation, develops essential skills, and ensures equal opportunities in education. Teachers who incorporate outdoor learning are able to cultivate enriched educational environments and provide holistic learning experiences that promote academic achievement, personal development, and environmental literacy.

0.1.3. Outdoor Learning Models and Approaches

Philosophers such as Socrates, Plato, and Aristotle emphasized that we perceive reality through our senses; they shaped the purpose of education around creating a sense of responsibility towards nature, culture, and all living things (Öztürk 2009). These philosophers, highlighting the significance of science and the accurate use of human senses, maintained that the aim of education is to cultivate a sense of environmental responsibility. It should use scientific methods to help people understand human nature and the environment, and it should be based on the truths we perceive with our true senses. In this way, people can understand the value of their own existence and that of other living beings and respect them. Education should develop people's character and moral values and encourage them to seek the truth. In this way, people can become more social and responsible individuals. Years later, philosophers and scientists such as Rousseau, Locke, Schelling, Frobel, Basedow, and Pestalozzi emphasized the need for children to be in close contact with nature (Yıldırım & Özyılmaz Akamca 2017).

Many researchers have developed different models related to outdoor education. Some of these models include the “Outdoor Education Tree Model” (Priest, 1986), the “Outdoor Education Umbrella Model” (Bisson 1996), and the “Adventure Education and Experiential Learning Model” of the “European Institute for Outdoor Adventure Education and Experiential Learning”.

Priest's Outdoor Education Tree model is based on the following six fundamental principles:

- Outdoor education is a method that involves the learning process.
- It is primarily conducted in the open air and requires the organization of the learning environment.
- Outdoor education is a learning process that involves experiential processes.
- In outdoor education, children actively engage their cognitive, affective, and motor skills using all their senses.
- Outdoor education is based on interdisciplinary curricula.

- It is a method that involves interaction with people as well as the natural environment and its resources.

Additionally, Priest's "Outdoor Education Tree" model is visualized as shown in **Figure 2.** According to this diagram, the trunk of the tree represents outdoor education, while the two branches extending from the trunk represent adventure education and environmental education. Bisson (1996) designed the "Outdoor Education Umbrella" model as shown in **Figure 3** and proposed the outdoor experiential learning method for each section of this umbrella. Outdoor education, which forms the body of the umbrella, plays an effective role in other processes.

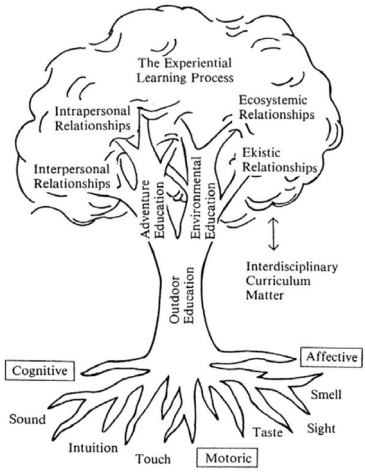


Figure 2. *Outdoor Education Tree (Priest, 1986)*

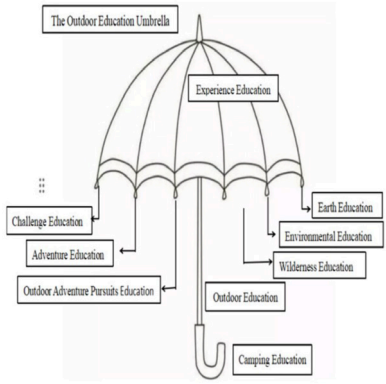


Figure 3. *The umbrella metaphor model of outdoor education (Bisson, 1996)*

"The European Institute for Outdoor Adventure Education and Experiential Learning" highlights how engaging in outdoor adventures and hands-on learning experiences can foster both personal growth and social skills. These educational approaches offer individuals opportunities to develop a range of skills, connect with nature, improve physical fitness, and enhance social and cultural understanding. By promoting and supporting these approaches, it aims to contribute to individuals' overall well-being and development (**Figure 4.**) (Higgins & Loynes, 1997).

ISBN: 978-625-6959-98-9

Figure 4. *The range & scope of outdoor education (Higgins & Loynes, 1997)*

0.2. School Gardens

In out-of-school environments, there are multiple spaces where students interact with living and non-living beings, thereby internalizing knowledge and constructing understanding. One such space is the schoolyard. Tandoğan (2016) stated that school gardens are open areas situated under the administration of schools worldwide and are typically defined as areas surrounded by hard structures around the school building. However, recent studies have shown that school gardens have moved away from this definition, becoming more functional and peaceful environments. In a well-designed schoolyard, it has been observed that students create their own learning areas and produce tangible outcomes within these areas, which enables them to cope more effectively with real-life challenges (Maloof, 2006). School gardens are regarded as environments where students can act freely and spontaneously, without fear of being judged, and where their sense of courage is even strengthened(Malone ve Tranter, 2003). Montessori school gardens can serve purposes beyond the standard curriculum by offering an inspiring environment that nurtures responsibility, patience, and a deeper appreciation of nature, while also supporting moral education (Bowker & Tearle, 2007).

School gardens offer students the chance to extend learning beyond conventional classroom boundaries, providing sensory-rich experiences and facilitating the development of healthier dietary habits through experiential activities(Davis vd., 2015). Langelloto and Gupta (2012) reported that participation in school garden programs led to an increase in children's consumption of fruits and vegetables. Engagement with school gardens can also deepen students' understanding of fundamental biological concepts and contribute to improved academic performance. Furthermore, involvement in such programs has been shown to positively influence students' self-esteem, life skills, and behavioral outcomes (Russo vd., 2017;Block vd., 2011).

Educational use of school gardens has been highlighted for its ability to foster student growth in academic achievement, social skills, and health-related practices. Bowker and Tearle (2007) found that school gardens improve curricula and provide students with opportunities to learn about topics such

as biodiversity and ecosystems in a deeper and more meaningful way. They also noted that school gardens have the potential to foster environmentally conscious attitudes and awareness of global issues. However, while there is considerable anecdotal evidence regarding the positive outcomes of nature-based educational programs for children, detailed research on the effects and sustainability of these programs remains limited (Ozer, 2006).

In developed countries, school gardens function not only as recreational spaces but also as active educational environments integrated into instructional practices (Erdönmez, 2007). In this context, school gardens provide rich learning opportunities where practical life experiences related to environmental education can be acquired. Consequently, activities conducted in garden settings contribute to the development of positive attitudes among students toward the natural environment and living spaces. Through this process, individuals gain knowledge and awareness of the natural structure of the environment and ecosystems (FAO, 2010).

In general, school gardens are recognized as valuable educational resources that contribute to students' holistic development and have the potential to enhance learning experiences across various domains. They provide hands-on, experiential learning opportunities, improve academic performance, promote healthy eating habits, and support the development of positive social connections. However, further research is needed to better understand the impacts of school gardens and to identify strategies that promote their sustainability and equitable access.

0.2.1. The History of Using School Gardens in Education

School gardens are designated areas where students can engage in scientific observations and learning within the school setting. Jan Amos Comenius (1592–1670), a Czech philosopher and educator and an early advocate of universal education, asserted that every school should include a garden to enable students to observe trees and flowers firsthand (Desmond et al., 2002). School gardens have a history of development spanning approximately two hundred years and have long been part of the educational process. School gardens first appeared in Europe in the early 17th century. However, they gained global recognition in the 19th century when they spread throughout the world with migration from the European continent (Kohlstedt, 2008). Friedrich Froebel, an educator who lived in Germany between 1782 and 1852, introduced the 'Kindergarten' as an official component of education, aiming to connect students with nature and the physical aspects of knowledge (Desmond et al., 2002). The Swiss educational reformer Pestalozzi, on the other hand, argued that practical education combined three elements referred to as "hands, heart, and mind," and introduced the concept of gardening to encourage students to observe nature (Desmond et al., 2002).

Following the Industrial Revolution and the ensuing period of extensive urbanization, school gardens emerged as one of the few opportunities for children to engage with nature. The first compulsory education program, established in

Prussia in 1811, incorporated gardening into the curriculum. By 1869, school gardens had become an integral component of natural sciences, agriculture, and vocational education programs. In the 20th century, the United States widely adopted school gardens as a strategy to address childhood obesity and diabetes, conditions linked to poor nutrition and insufficient physical activity (Ozer, 2006). Between 1890 and 1900 alone, thousands of school gardens were established in the United States, leaving a lasting influence on the educational landscape (Kohlstedt, 2008). Teachers have increasingly acknowledged the previously underappreciated role of school gardens in supporting education, environmental awareness, and both physical and mental development (Trelstad, 1997). Among the educators who shared their thoughts on school gardens was medical doctor Maria Montessori (1870-1952). Montessori emphasized that engaging children in school gardening has profound impacts on their physical health, as well as their social, cognitive, and ethical development. She argued that when a child understands how a plant's growth and life depend on their own care, it fosters a genuine sense of responsibility and nurtures an appreciation for life (Garitsis, 2016).

The outbreak of the First World War ushered in a period of significant growth for school gardens. From that point on, not only educators but also government authorities began to intervene. During this period, numerous policies facilitating the development of school gardens worldwide were implemented, and funding investments were increased. Starting from the 1910s, playground materials made of iron, steel, and wood were used as components of school gardens. In the 1950s and 1960s, playgrounds came under the influence of new theories in child development and art, leading to the widespread incorporation of maritime and imagination-based themes in playground design. At first, these themes used in playgrounds appeared original and interesting to children; however, over time, these areas lost their appeal. After the 1960s, diversity in playgrounds began to come to the forefront, as so-called "junk" or "adventure" playgrounds started to emerge. These areas, which required physical effort and included missing components to encourage creative problem-solving, were considered suitable playgrounds. Nevertheless, they were deemed impractical due to the high cost, difficulty, and potential danger involved in their design process. Subsequently, playgrounds that were both creative and multifunctional were developed. In these playgrounds as well, children's physical, developmental, creative, and social needs were taken into consideration, with a focus on different types of playground design and the selection of primary materials. In the 1980s, fixed equipment in school gardens became more popular with the introduction of painted steel structures. In fact, it often became the only recommended form of playground arrangement (Schaefer, 2003, Erözeren&Demirkasımoğlu, 2022). With these characteristics, the garden-based education approach can be utilized in the development of personal life skills and in all stages of the basic education process. This educational approach is fundamentally based on the principle of "learning by doing and experiencing," providing students with an interactive learning environment. Through garden activities, it aims to help students develop skills in engaging with nature and being productive.

Research on garden-based education shows that in schools incorporating school garden practices and shaping their curricula accordingly, individuals develop positive attitudes toward nature and acquire skills in problem-solving, critical thinking, and inquiry-based learning (Eminel Kutay, 2019; Taşçı ve Beşiktaşlı, 2019). In garden-based education, educational workspaces are used as laboratories that enable hands-on learning. In these areas, students can scientifically examine the developmental stages of a plant and observe the air, soil, and surrounding biodiversity. These learning environments can be designed as ideal living spaces that provide real-life experiences for exploring the ecosystem. Within the garden-based learning approach, students gain the ability to take responsibility for their own learning by engaging in experimental activities and applying the knowledge they acquire.

Out-of-school environments hold a crucial place in supporting children's learning. Since the beginning of the 20th century, the garden-based education approach has become a practical field used as an experimental teaching laboratory and has served as an interdisciplinary area of activity for educators (Taşçı ve Beşiktaşlı, 2019). In this context, over the past 30 years, the garden-based education movement has emerged as a means of fostering authentic, meaningful, and hands-on learning. Garden-based education is defined as an educational approach in which the garden is used as a teaching tool. According to another definition, the garden-based education approach is a philosophical orientation that integrates meaningful learning experiences in school gardens with the relevant curriculum (Rosenthal, 2018, Williams, 2018). The incorporation of garden-based education into school curricula in the United States has led to its institutionalization within the educational system. Moreover, these developments have extended its influence to higher education curricula, and in recent years, garden-based education has been recognized as an innovative learning context, particularly within Initial Teacher Education programs. Today, the educational significance of school gardens is widely recognized. At the same time, with the increasing interest in environmental issues, the role of school gardens as a tool for environmental education and in helping children reconnect with nature is emphasized (Mumcu & Bozdoğan, 2024; Aksu, 2023; Zhang et al., 2022; Ürey, 2018). Their inclusion in the school curriculum has transformed school gardens into integrated learning environments.

0.2.2. Use of School Gardens in Science Education

Science courses encompasses situations and phenomena that are part of our daily lives. Abstract concepts are concretized through experiments conducted in laboratory settings. However, for subjects that cannot be effectively experienced within the school setting, there is a need for out-of-school learning environments that offer opportunities for meaningful and enduring learning experiences. Science education enhances students' curiosity about the world, develops their skills in scientific thinking, planning, measuring, observing, and analyzing, and promotes their scientific literacy. Additionally, it aims to foster students' ability to learn independently, cope with real-life phenomena, think creatively, make reasoned decisions, and solve problems effectively. (Karakaş

& Sevim, 2019). “The American National Science Teachers Association” (NSTA), in its report “Learning Science in Informal Environments”, underscores the important role of out-of-school learning environments in science education. The report defines informal science education as learning experiences obtained outside the classroom through institutions such as aquaparks, natural history museums, observatories, parks, zoos, science and technology centers, botanical gardens, and research organizations (NSTA, 2009). Today, out-of-school learning environments encompass a diverse array of settings, including school gardens, streets, museums, zoos, botanical gardens, science centers, planetariums, and national parks. These natural areas in outdoor spaces can create a rich environment for experiential learning(Aslan vd., 2023). While some teachers utilize the school garden as an out-of-school learning environment, others consider science centers within this scope. Out-of-school settings encompass a broad range of environments where learning occurs beyond the classroom and examine contexts commonly employed in the literature on science education. Furthermore, the use of the school garden as a learning environment has been found to enhance academic learning, as well as increase motivation and interest in the subject matter(Jegstad vd., 2022). However, despite this potential, the utilization of school gardens as outdoor learning environments remains largely absent in educational practice (Dijk-Wesselius vd., 2020). Research shows that only a small proportion of teachers use school gardens as learning environments, and that these uses are limited to physical education and science(Dijk-Wesselius vd., 2020). One possible barrier is the lack of awareness among teachers regarding school gardens as spaces for science learning(Cronin-Jones, 2000). This limited awareness may result from insufficient professional development opportunities in outdoor education.

Consequently, many teachers focus on traditional classroom education or off-site field experiences, overlooking the potential of school gardens for outdoor science education. To address these challenges, it is essential to offer teachers professional development opportunities that enhance their understanding of the benefits and instructional strategies associated with integrating school gardens into science education (Koto & Susanta, 2019; Cronin-Jones, 2000). A review study generally indicates that school gardens positively influence students' science achievement and eating habits (Blair, 2009). However, another study found that nutrition programs and school gardens should overlap, and that students' eating habits are positively influenced when they consume vegetables grown in the school garden during meal times (Graham vd., 2005; Morgan vd., 2010). In addition, school gardens provide opportunities for experiential learning and help reinforce the knowledge acquired. A study by Robinson and Zajicek (2005) reported that students who participated in a “School Garden Program” for one year demonstrated significantly greater development in life skills compared to those who did not participate. School garden programs positively influence students' attitudes toward science lessons and, consequently, appear to have a beneficial impact on their development (Ürey & Çepni, 2014). Garden-based learning promotes interaction with nature and learning through hands-on, experiential activities, thereby increasing

students' interest in science lessons(Riggs, 2020). Research on out-of-school learning environments in science education, especially regarding the use of school gardens, indicates that such practices positively influence students' academic performance, social development, and emotional well-being(Mumcu & Bozdoğan 2024); Mann vd., (2022); Zhang vd., (2022). Activities conducted in school gardens have been shown to enhance students' interest in science, develop their scientific process skills, promote environmental awareness, and make learning more engaging. In addition, these settings support the development of social skills and pro-environmental attitudes; however, their effects on students' motivation for science learning and academic achievement appear to be variable (Yörük 2023); Tafraci & Aydin (2023); Feille, 2021). While students enjoy gardens enriched with natural elements, it has been observed that planned activities conducted under teacher guidance further enhance this benefit. To utilize school gardens more effectively in education, it is suggested that infrastructural improvements be made, teachers receive relevant training, and schoolyard activities be more thoroughly integrated into curricula(Emek 2019, Greer vd., 2019).

In conclusion, it is considered important that future studies on school gardens focus on the factors influencing teachers' use of these spaces and examine how these environments can be more widely utilized across various science topics. In this context, enhancing the planned use of school gardens can be achieved through increasing professional development programs for teachers, strengthening the physical infrastructure, expanding interdisciplinary activities, and promoting environmental awareness and sustainability-based initiatives. Moreover, ensuring stronger integration of such activities into curricula can provide valuable contributions to both students and the education system. The successful integration of school gardens into science education relies on pre-service teachers' capacity to plan and implement these environments purposefully. In this context, examples of school garden activities that pre-service teachers can apply during their teaching practice are provided below.

1.Examples of science learning activities in school gardens

1.1. Activity 1: Observing the conditions necessary for seed germination in the garden

Objective: To enable students to observe, using setups established in the school gardens, that seeds do not necessarily require soil or direct sunlight to germinate, and that they can sprout in different environments when suitable conditions (moisture, warmth, and oxygen) are provided.

Materials Required:

•Bean or lentil seeds

•Plastic cups or small jars

•Soil

•Cotton

ISBN: 978-625-6959-98-9

•Water container

•Transparent plastic bags

•Labels and markers

•Thermometer (optional)

Procedure

Students first respond to the question, "What is needed for a seed to awaken?" and formulate their hypotheses in the classroom. The teacher selects the hypotheses that can be observed through experiments. Based on students' input, the dependent and independent variables for these hypotheses are determined. Then, students move to the schoolyard to conduct the experiment. Five separate setups are established to test the necessity of oxygen, appropriate temperature, water, light, and soil for seed germination

Setup 1:

Hypothesis: If a seed is placed in an oxygen-free environment, germination will not occur.

Dependent Variable: Seed germination

Independent Variable: Oxygen

Control Variables: Temperature, water, light, soil

Seed germination		
Oxygen	------	
Temperature	25 oC	25 oC
Water		
Soil		
Light		

Setup 2:

Hypothesis: Germination does not occur below a certain temperature.

Dependent variable: Seed germination

Independent variable: Temperature

Control variables: Oxygen, water, light, soil

Seed germination		
Oxygen		
Temperature	10 oC	25 oC
Water		
Soil		
Light		

Setup 3:

Hypothesis: If the seed does not receive enough water, germination will not occur.

Dependent variable: Seed germination

Independent variable: Water

Control variables: Temperature, light, oxygen, soil

Seed germination		
Temperature	oC	oC
Water	-----	
Soil		
Light		
Oxygen		

ISBN: 978-625-6959-98-9

Setup 4:

Hypothesis: If the seed remains in a place without light, germination will not occur.

Dependent variable: Seed germination

Independent variable: Light

Control variables: Temperature, water, oxygen, soil

Seed germination		
Oxygen		
Temperature	25 oC	25 oC
Water		
Soil		
Light		-----

Setup 5:

Hypothesis: If the seed is not planted in soil, it will not germinate.

Dependent variable: Seed germination

Independent variable: Soil

Control variables: Temperature, water, light, oxygen

Seed germination		
Oxygen		
Temperature	25 oC	25 oC
Water		
Soil	-----	
Light		

1.Groups prepare their containers according to the setup described above, label them, and place an equal number of seeds in each.

2.They make observations at the same time each day and record the condition of the seeds in the **Table 2.** (e.g., swollen, cracked, root emergence, etc.).

Table 2. *Daily observations of seed growth.*

Day	Experimental Setups					
	1	2	3	4	5	6
Day 1						
Day 2						
Day 3						
Day 4						
Day 5						

3.After 5–7 days, students compare germination across different environments.

Results and Discussion:

•In which environments did germination occur?

•Is soil necessary for seed germination?

•What were the essential conditions for germination?

At the end of the activity, students are assigned to create a poster using the photographs taken during the observation days and the data recorded in their tables.

1.2. Activity 2: Let's explore the absorption of light in nature

Objective: The aim of this activity is to enable students to observe that colors in nature absorb light at different levels and to relate this phenomenon to everyday situations, such as the variation in clothing colors preferred across different seasons.

Required Materials:

- 4 plastic cups
- Black, white, blue, and red cardboard (for wrapping the cups)
- Thermometer (or a simple digital temperature sensor)
- Water
- Timer / stopwatch
- Observation form or data table

Procedure:

Students are first asked the following questions in the classroom: “Why do you feel warmer on a sunny day when wearing a black T-shirt?” and “Why are light-colored roofs preferred for buildings?” Based on students’ responses, a brief introduction is provided on the concepts of light energy, reflection, and absorption. Afterward, students go outside to conduct an activity in the schoolyard to observe which colors absorb more or less light. They are divided into groups of three or four, and each group wraps four plastic cups with four different colored pieces of cardboard. Each cup is filled with 100 mL of water, and the initial temperature of the water is measured using a thermometer. A sunny area in the schoolyard is selected, and the prepared cups are placed there. After 20–25 minutes, all groups measure the final temperature of the water in each cup and determine which color covering resulted in the greatest temperature increase (Figure 5) .

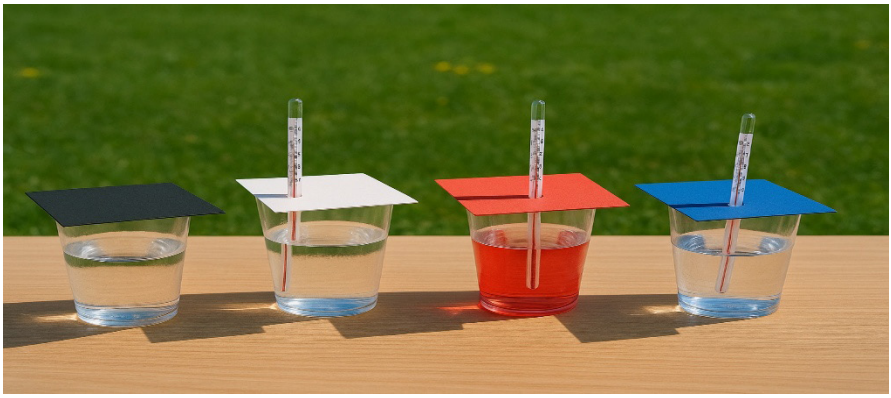


Figure 5 : *Temperature change in cups covered with different colors (Figure created by the author using ChatGPT, 2025).*

Finally, students are asked to rank the colors according to the temperature increase and record the results in Table 3.

Table 3: *A sample table for recording group data*

Color of the cup	Initial Temperature	Final Temperature	Temperature Change	Ranking
Black				
Blue				
White				
Red				

To further develop this activity, measure and compare the temperature differences on surfaces in the school garden (soil, stone, asphalt, leaves). Arrange these measurements in a **Table 4** and perform a comparison.

Table 4: *Temperature comparison of different surfaces in the school garden.*

Object	Colour	Temperature
Leef		
Tree trunck		
Stone		
Asphalt		
Soil		

At the end of the activity, students are asked to investigate real-life applications based on how colors absorb light. They are expected to compile their findings into a report, which will then be displayed on the classroom bulletin board.

REFERENCES

Aksu, F. (2023). *Çevreye yönelik tutum ile okul bahçesi yeşil alan kullanımının çocuklardaki çatışma çözme davranışlarını yordama düzeyi* [Yüksek Lisans Tezi]. Aydın Adnan Menderes Üniversitesi.

Anderson, D., Kisiel, J., & Storksdieck, M. (2006). Understanding teachers' perspectives on field trips: Discovering common ground in three countries. *Curator: The Museum Journal, 49*(3), 365–386.

Armağan, B. (2015). *İlkokul dördüncü sınıf fen öğretiminde okul dışı öğrenme ortamları: Bir eylem araştırması* [Yüksek Lisans Tezi]. Dokuz Eylül Üniversitesi.

Aslan, A., Batman, D., Durukan, Ü. G. (2023). Academics' perspective on out-of-school learning environments. *Turkish Journal of Education, 1*, 28-49.

Atmaca, S. (2021). Derslik dışı fen etkinliklerinin öğretmen adayları üzerindeki etkileri: Bir eylem araştırması. *Gazi Eğitim Fakültesi Dergisi, 41*(2), 661-696. https://doi.org/10.17152/gefad.894789

Bakioğlu, B. & Karamustafaoğlu, O. (2020). Okul dışı öğrenme ortamlarının öğretim sürecinde kullanımına ilişkin öğrenci görüşleri. *İnformal Ortamlarda Araştırmalar Dergisi*, *5*(1), 80-94.

Baygül, A.(2023). Okul Dışı Öğrenme Ortamlarında Yapılan Etkinliklerin Öğrencilerin Enerji Kaynaklarına Yönelik Farkındalıklarına ve Bilgi Düzeylerine Etkisi. Uludağ Üniversitesi Eğitim Fakültesi Dergisi, 36(3), 840-865. https://doi.org/10.19171/uefad.1315089

Becker, C., Lauterbach, G., Spengler, S., Dettweiler, U., & Mess, F. (2017). Effects of regular classes in outdoor education settings: A systematic review on students' learning, social and health dimensions. *International Journal of Environmental Research and Public Health*, *14*(5), 485. https://doi.org/10.3390/ijerph14050485

Berberoğlu, E. O., Uygun, S. (2013). Sınıf dışı eğitimin dünyadaki ve Türkiye'deki gelişiminin incelenmesi. Mersin Üniversitesi Eğitim Fakültesi Dergisi, *9*(2), 32-42.

Bisson, C. (1996). *The outdoor education umbrella: A metaphoric model to conceptualize outdoor experiential learning methods* [Conference paper]. ERIC. https://eric.ed.gov/?id=ED416049

Blair, D. (2009). The child in the garden: An evaluative review of the benefits of school gardening. *The Journal of Environmental Education*, *40*(2), 15-38.

Block, K., Gibbs, L., Staiger, P. K., Gold, L., Johnson, B., Macfarlane, S., Long, C., & Townsend, M. (2012). Growing community: The impact of the stephanie alexander kitchen garden program on the social and learning environment in primary schools. *Health Education & Behavior: The Official Publication of the Society for Public Health Education*, *39*(4), 419-432. https://doi.org/10.1177/1090198111422937

Bowker, R., & Tearle, P. (2007). Gardening as a learning environment: A study of children's perceptions and understanding of school gardens as part of an international project. *Learning Environmental Research, 10*, 83–100.

Cronin-Jones, L. (2000). The effectiveness of schoolyards as sites for elementary science instruction. *School Science and Mathematics, 4*, 203-211.

Davis, J. N., Spaniol, M. R., & Somerset, S. (2015). Sustenance and sustainability: Maximizing the impact of school gardens on health outcomes. *Public Health Nutrition, 13*, 2358-2367.

Demirel, Ö. (2020). *Eğitimde program geliştirme* (29. bs.). Pegem Akademi. https://doi.org/10.14527/9786053180265

Desmond, D., Grieshop, J., & Subramaniam, A. (2002). *Revisiting garden-based learning in basic education*. Food and Agriculture Organization of the United Nations.

Dierking, L. D., Falk, J. H., Rennie, L., Anderson, D., & Ellenbogen, K. (2003). Policy statement of the "informal science education" ad hoc committee. *Journal of Research in Science Teaching, 40*(2), 108-111.

Dijk-Wesselius, J. E., van den Berg, A. E., Maas, J., & Hovinga, D. (2020). Green schoolyards as outdoor learning environments: Barriers and solutions as experienced by primary school teachers. *Frontiers in Psychology*, *10*, 2919. https://doi.org/10.3389/fpsyg.2019.02919

Dyment, J. (2005). Green school grounds as sites for outdoor learning: Barriers and opportunities. *International Research in Geographical and Environmental Education, 1*, 28-45.

Edwards-Jones, A., Waite, S., & Passy, R. (2018). Falling into LINE: School strategies for overcoming challenges associated with learning in natural environments (LINE). *Education 3-13*, *46*(1), 49-63. https://doi.org/10.1080/03004279.2016.1176066

Eigenschenk, B., Thomann, A., McClure, M., Davies, L., Gregory, M., Dettweiler, U., & Messerli-Bürgy, N. (2019). Benefits of outdoor sports for society: A systematic literature review and reflections on evidence. *International Journal of Environmental Research and Public Health, 16*(6), 937. https://doi.org/10.3390/ijerph16060937

Emek, E. (2019). *Sınıf öğretmenlerinin fen bilimleri dersinde okul bahçesi kullanımına yönelik görüşleri* [Yüksek Lisans Tezi]. Niğde Ömer Halisdemir Üniversitesi.

Eminel Kutay, M. (2019). *Çocukların doğa ile ilişkilerinin güçlendirilmesinde okul bahçelerinin rolü* [Yüksek Lisans Tezi]. Ankara Üniversitesi.

Erdönmez, İ. M. Ö. (2007). İlköğretim okulu bahçelerinde peyzaj tasarım normları. *İstanbul Üniversitesi Orman Fakültesi Dergisi, 57*, 107-122.

Erol Işıklı, Ü. (2023). *Okul dışı öğrenme ortamlarının fen eğitimindeki etkililiğine yönelik bir meta-analiz çalışması* [Yüksek Lisans Tezi]. Artvin Çoruh Üniversitesi.

Erözeren, H. &Demirkasımoğlu, N.(2022). İlkokul bahçelerinin mevcut durumuna ve ideal okul bahçelerine ilişkin öğretmen görüşleri. Kırıkkale Üniversitesi Sosyal Bilimler Dergisi, 12(1),225-257.

Eshach, H. (2007). Bridging in-school and out-of-school learning: Formal, non-formal, and informal education. *Journal of Science Education and Technology*, *16*(2), 171-190. https://doi.org/10.1007/s10956-006-9027-1

Eugenio, M., & Aragón, L. (2018). Experiencias educativas en relación a la agroecología en la educación superior española contemporánea: Presentación de la red universidades cultivadas. *Agroecología*, *11*(1), 31-39.

FAO. (2010). A new deal for school gardens. Rome. Retrieved from https://openknowledge.fao.org/server/api/core/bitstreams/49499ea4-74c0-4622-8dae-0d98d8b9e14a/content

Feille K, (2021). A framework for the development of schoolyard pedagogy. *Research in Science Education*, *51*, 1687-1704.

Garitsis, I. (2016). *The school garden as a field for entering changes aiming at the evolution of the school in the direction of sustainability* [PhD Thesis]. Aristotle University of Thessaloniki.

Graham, H., Beall, D. L., Lussier, M., McLaughlin, P. & Zidenberg-Cherr, S. (2005). Use of school gardens in academic instruction. *Journal of Nutrition Education and behavior*, *37*(3), 147-151.

Greer, A. E., Rainville, K., Knausenberger, A., & Sandolo, C. (2019). Opportunities for school garden-based health education in a lower-income, diverse, urban school district. *American Journal of Health Education*, *50*(4), 257-266. https://doi.org/10.1080/19325037.2019.1616010

Higgins, P., & Loynes, C. (1997). On the nature of outdoor education. *A Guide for Outdoor Educators in Scotland*, *13*, 6-8.

Hunnius, S. (2022, June 20). *Early cognitive development: Five lessons from infant learning*. *Oxford Research Encyclopedia of Psychology*. Retrieved October 8, 2025, from https://oxfordre.com/psychology/view/10.1093/acrefore/9780190236557.001.0001/acrefore-9780190236557-e-821

James, J. K., & Williams, T. (2017). School-Based experiential outdoor education: A neglected necessity: A neglected necessity. *Journal of Experiential Education*, *40*(1), 58-71. https://doi.org/10.1177/1053825916676190

Jegstad K M, Höper J, Remmen K B, (2022). Using the schoolyard as a setting for learning chemistry: A sociocultural analysis of pre-service teachers talk about redox *Chemistry, J. Chem. Educ*ation, *99*, 629-638.

Karakaş, A., & Sevim, S. (2019). Fen öğretiminin dünü, bugünü, geleceği. H. Bağ & S. Say (Ed.), *Fen öğretiminde yeni yaklaşımlar-I* (1. bs., ss. 2–25) içinde. Pegem Akademi. https://doi.org/10.14527/9786052418352

Karslı, G. ve Kurt, M. (2022). 2012-2021 yılları arası Türkiye'de okul dışı öğrenme ortamları konulu araştırmaların incelenmesi: Doküman analizi. *EKEV Akademi Dergisi*, (92), 86-104. https://doi.org/10.17753/sosekev.1111442

Kohlstedt, S. G. (2008). "A better crop of boys and girls": The school gardening movement, 1890–1920. *History of Education Quarterly, 48*, 58-93.

Koto, I., & Susanta, A. (2019). Introducing outdoor learning in science and mathematics to elementary school teachers via professional development. *Proceedings of the 144th International Conference on Educational Sciences and Teacher Profession (ICETeP 2018)* (ss. 287–290). Atlantis Press.

Laçin Şimşek, C. (2011). Okul dışı öğrenme ortamları ve fen eğitimi. C. Laçin Şimşek (Ed.), *Fen öğretiminde okul dışı öğrenme ortamları* (ss. 1–23) içinde. Pegem Akademi.

Langellotto, G. A., & Gupta, A. (2012). Gardening increases vegetable consumption in school-aged children: A meta-analytical synthesis. *HortTechnology, 22*, 430-445.

Lugg, A., & Slattery, D. (2003). Use of national parks for outdoor environmental education: An Australian case study. *Journal of Adventure Education & Outdoor Learning, 1*(3), 77-92.

Malone, K., & Tranter, P. (2003). Children's environmental learning and the use, design, and management of schoolgrounds. *Children, Youth and Environments, 13*(2), 87-137.

Maloof, J. (2006). Experience this! The experiential approach to teaching environmental issues. *Applied Environmental Education and Communication, 5*(3), 193-197.

Mann, J., Gray, T., Truong, S., Sahlberg, P., Bentsen, P., Passy, R., & others. (2021). A systematic review protocol to identify the key benefits and efficacy of nature-based learning in outdoor educational settings. *International Journal of Environmental Research and Public Health, 3*(18), 1199.

Mann, J., Gray, T., Truong, S., Brymer, E., Passy, R., Ho, S., Sahlberg, P., Ward, K., Bentsen, P., Curry, C., & Cowper, R. (2022). Getting out of the classroom and into nature: A systematic review of nature-specific outdoor learning on school children's learning and development. *Frontiers in Public Health, 10,* 877058. https://doi.org/10.3389/fpubh.2022.877058

Marchant E, Todd C, Cooksey R, Dredge S, Jones H, Reynolds D, et al. (2019) Curriculumbased outdoor learning for children aged 9-11: A qualitative analysis of pupils' and teachers' views. *PLoS ONE 14*(5): e0212242. https://doi.org/ 10.1371/journal.pone.0212242

McCree, M., Cutting, R., & Sherwin, D. (2018). The hare and the tortoise go to forest school: Taking the scenic route to academic attainment via emotional wellbeing outdoors. *Early Child Development and Care, 188*(7), 980-996.

Metin, M. (2020). *Fen bilimleri dersi kapsamında planetaryuma düzenlenen bir gezinin 7. sınıf öğrencilerinin akademik başarı, ilgi ve motivasyonlarına etkisi* [Yüksek Lisans Tezi]. Tokat Gaziosmanpaşa Üniversitesi.

Mumcu, M. T., & Bozdoğan, A. E. (2024). Ses ve özellikleri konusunda okul dışı ortamlarda yapılan etkinliklerin ortaokul öğrencilerinin fen konularına olan ilgilerine ve fen öğrenme motivasyonlarına etkisi. *Gazi Eğitim Bilimleri Dergisi*, *10*(1), 66-103. https://dergipark.org.tr/tr/pub/gebd/issue/83954/1356948

National Research Council. (2009). *Learning science in informal environments: People, places, and pursuits*. P. Bell, B. Lewenstein, A. W. Shouse, & M. A. Feder (Eds.), Committee on Learning Science in Informal Environments, Board on Science Education, Center for Education, Division of Behavioral and Social Sciences and Education. The National Academies Press.

Nundy, S. (1999). The fieldwork effect: The role and impact of fieldwork in the upper primary school. *International Research in Geographical and Environmental Education, 8*(2), 190-198.

Ozer, E. J. (2006). The effects of school gardens on students and schools: Conceptualization and considerations for maximizing healthy development. *Health Education & Behavior, 34*(6), 846-863.

Özdemir, B. (2019). *7. sınıf güneş sistemi ve ötesi ünitesinin öğretiminde okul dışı öğrenme ortamlarının kullanılmasının akademik başarı, motivasyon ve kalıcılığa etkisi* [Yüksek Lisans]. Çanakkale Onsekiz Mart Üniversitesi.

Öztürk, Ş. (2009). Okulda eğitimle bütünleştirilmiş mekân dışı eğitim. *Milli Eğitim, 181*(37), 131-144.

Priest, S. (1986). Redefining outdoor education: A matter of many relationships. *Journal of Environmental Education, 17*(3), 13-15.

Quibell, T., Charlton, J., & Law, J. (2017). Wilderness schooling: A controlled trial of the impact of an outdoor education programme on attainment outcomes in primary school pupils. *British Educational Research Journal, 3*(43), 572-587.

Rennie, L. J., Feher, E., Dierking, L. D., & Falk, J. H. (2003). Toward an agenda for advancing research on science learning in out-of-school settings. *Journal of Research in Science Teaching, 40*(2), 112-120. https://doi.org/10.1002/tea.10067

Riggs, C. M. (2020). *Science in the garden: Place-Based learning as education enrichment* [Doctoral dissertation]. Southern Illinois University.

Robinson, C. W. & Zajicek, J. M. (2005). Growing minds: The effects of a one-year school garden program on six constructs of life skills of elementary school children. *Hort Technology*, *15*(3), 453- 457.

Rosenthal, J. L. (2018). Teacher candidates in the garden. *Science Activities*, *55*(1-2), 20-27.

Russo, A., Escobedo, F. J., Cirella, G. T., & Zerbe, S. (2017). Edible green infrastructure: An approach and review of provisioning ecosystem services and disservices in urban environments. *Agriculture, Ecosystems & Environment, 242*, 53-66.

Şahin, A. ve Asal Özkan, R. (2023). 2010-2022 yılları arasında okul dışı öğrenme ortamlarına ilişkin yapılan lisansüstü tezlerin incelenmesi. *Sakarya Üniversitesi Eğitim Fakültesi Dergisi*, *23*(1), 70-81. https://doi.org/ 10. 53629/sakaefd.1282463

Tal, T., Alon, N., & Morag, O. (2014). Exemplary practices in field trips to natural environments. *Journal of Research in Science Teaching, 4*(51), 430-461.

Tafraci, S., & Aydin, A. (2023). Okul dışı öğrenme ortamlarında yapılan etkinliklerin öğrencilerin bilimin doğası anlayışlarına etkisi ve bu etkinlikler hakkındaki görüşleri. *Uludağ Üniversitesi Eğitim Fakültesi Dergisi*, *36*(3), 925-953. https://doi.org/10.19171/uefad.1343908

Tandoğan, O. (2016). Çocuklar için daha yaşanılır okul bahçeleri. *Megaron, 11*(4), 629-637.

Taşçı, G., & Beşiktaşlı, E. (2019). Bahçe temelli öğrenme ile ilgili öğretmen görüşlerinin incelenmesi. In *VI. International Eurasian Educational Research Congress*.

Thomas G, 2015, Signature pedagogies in outdoor education. *Asia-Pacific Journal of Health, Sport and Physical Education*, *2*(6), 113-126.

Trelstad, B. (1997). Little machines in their gardens: A history of school gardens in America, 1891 to 1920. *Landscape Journal, 16*(2), 161-173.

Ürey, M., & Çepni, S. (2014). Fen temelli ve Disiplinlerarası okul bahçesi programının öğrencilerin fen ve teknoloji dersine yönelik tutumları üzerine etkisinin farklı değişkenler açısından değerlendirilmesi. *Ondokuz Mayıs Üniversitesi Eğitim Fakültesi Dergisi, 33*(2), 537-548.

Ürey, M., Göksu, V., ve Karaçöp, A. (2017). Serbest etkinlik çalışmaları dersi kapsamında geliştirilen okul bahçesi programına yönelik öğretmen görüşleri. *İlköğretim Online*, *16*(1), 1-14.

Williams, D. (2018). Garden-based education. *Oxford Research Encyclopedia of Education*. Retrieved October 22, 2025, from https://oxfordre.com/education/view/10.1093/acrefore/9780190264093.001.0001/acrefore-9780190264093-e-188

World Health Organization (WHO). (2019). *Guidelines on physical activity, sedentary behavior and sleep for children under 5 years of age*. World Health Organization.

Yılmaz, S., & Bulut, Z. (2002). Kentsel mekanlarda çocuk oyun alanları planlama ve tasarım ilkeleri. *Atatürk Üniversitesi Ziraat Fakültesi Dergisi, 33*, 345-351.

Yli-Panula, E., Jeronen, E., & Lemmetty, P. (2019). Teaching and learning methods in geography promoting sustainability. *Education Sciences, 10*(1), 5. https://doi.org/10.3390/educsci10010005

Yörük, A. O. (2023). *Okul bahçesinde bilim: 7. Sınıf fen bilimleri dersinde okul bahçesinin kullanılması üzerine bir araştırma* [Yüksek Lisans Tezi]. Afyon Kocatepe Üniversitesi.

Zhang, Z., Stevenson, K. T., & Martin, K. L. (2022). Use of nature-based schoolyards predicts students' perceptions of schoolyards as places to support learning, play, and mental health. *Environmental Education Research*, *28*, 1271-1282.

ABOUT THE AUTHORS

Ramazan ŞAHİN is a graduate of Necmettin Erbakan University in Science Education and is currently pursuing his master's degree in the Department of Science Education at the Graduate School of Educational Sciences, Necmettin Erbakan University. He is currently working as a science teacher and conducts studies on science education in school gardens.

Nuriye KOÇAK completed her undergraduate, master's, and doctoral studies in the Department of Chemistry at Selçuk University. She is currently a faculty member in the Department of Mathematics and Science Education at Necmettin Erbakan University, Ahmet Keleşoğlu Faculty of Education. Her academic interests include chemistry, inorganic chemistry, science education, chemistry education, teacher education, green and sustainable chemistry, and occupational health and safety training. Nuriye KOÇAK has presented numerous papers at national and international conferences and has published articles and book chapters on science and chemistry education, green chemistry applications, sustainability, and occupational safety.

Kadriye KAYACAN completed her undergraduate education in 2002 at Selçuk University, Faculty of Education, in Science and Mathematics Education program. She earned his master's degree in 2008 from the Institute of Science at Selçuk University and her doctorate in 2014 from the Institute of Education at Gazi University. She is currently serving as an Associate Professor in the Science Education Department of the Mathematics and Science Education department at Konya Necmettin Erbakan University Ahmet Keleşoğlu Faculty of Education. Her scientific studies focus on science education, inquiry based learning, web 2.0 tools, brain based learning. Kadriye KAYACAN has numerous published articles, book chapters, and conference papers in the field of science education.

Similarity Index

The similarity index obtained from the plagiarism software for this book chapter is 12%.

To Cite This Chapter

Şahin, R., Koçak, N., & Kayacan, K. (2025). School Gardens as Out-of-School Learning Environments for Science Education. In O. Çardak (Ed.), *Current Studies in Educational and Social Sciences 2025* (pp. 44-68). ISRES Publishing.

ISBN: 978-625-6959-98-9

REIMAGINING ENGINEERING EDUCATION: PEDAGOGICAL FOUNDATIONS AND FUTURE DIRECTIONS

Semra TANRIÖVER
Science Education Teacher
Ministry of National Education Antalya Science and Art Center 1, Turkey
E-mail: semtover@hotmail.com
ORCID: 0000-0003-0979-9384

1. Introduction

The deliberate incorporation of engineering into pre-college curricula across the globe, particularly within the Science, Technology, Engineering, and Mathematics (STEM) integration movement, signifies a pivotal shift in educational priorities (Carr et al., 2012; Cunningham & Carlsen, 2014; Pleasants, 2023). This growing emphasis is driven by the need to cultivate a technologically proficient citizenry and ensure a diverse, capable engineering workforce (Capobianco et al., 2011; Strimel et al., 2020). The publication of foundational documents like the Next Generation Science Standards (NGSS Lead States, 2013) in the United States accelerated this integration by formally recognizing engineering practices within the science curriculum (Barak et al., 2024; Cunningham & Kelly, 2017). However, the inclusion of engineering presents systemic challenges, notably concerning defining the discipline's specific content and pedagogical approaches for K–12 contexts (Barak et al., 2024; Strimel et al., 2020).

Engineering education seeks to achieve engineering literacy for all students, defined as the integration of specific content knowledge, habits of mind, and disciplinary practices (American Society for Engineering Education [ASEE], 2020; Strimel et al., 2020). Achieving this goal requires a cohesive epistemological foundation that differentiates engineering from science and technology, thereby avoiding the conflation of disciplinary practices and ensuring authentic learning experiences (Antink-Meyer & Brown, 2019; Cunningham & Kelly, 2017; Yesilyurt, Deniz, & Kaya, 2024). Without a clear, validated framework for what constitutes core engineering content and appropriate instructional strategies, implementation often remains inconsistent and inequitable (National Academies of Sciences, Engineering, & Medicine [NASEM], 2020; Strimel et al., 2020).

This chapter addresses these critical needs by synthesizing contemporary research on engineering education. It first establishes a theoretical foundation by exploring the epistemology of engineering. It then examines the central

role of the Engineering Design Process (EDP), detailing the instructional mechanisms, such as reflective decision-making and evidence-based reasoning, that facilitate deep student learning. Finally, it analyzes current challenges, particularly concerning equity and professional development, proposing future directions necessary for developing rigorous, cohesive, and universal engineering learning pathways in K–12 schools.

2.Theoretical Framework

The successful implementation of engineering education in K–12 settings hinges on a clear conceptualization of the Nature of Engineering (NOE) (Barak et al., 2024; Pleasants, 2023). Experts agree that defining the NOE is essential for developing engineering literacy, distinguishing it from scientific literacy, and promoting a comprehensive understanding of contemporary society (Antink-Meyer & Arias, 2022; Pleasants & Olson, 2019; Yesilyurt et al., 2024). The complexity in defining engineering arises because it can be conceptualized simultaneously as a process, a field, and an overall approach (Antink-Meyer & Brown, 2019).

2.1. The Nature of Engineering and Epistemic Practices

One powerful methodological framework for characterizing the NOE is the Family Resemblance Approach (FRA), which focuses on the cognitive and epistemic domains of the discipline (Barak et al., 2024; Kaya & Erduran, 2016; Yesilyurt et al., 2024). Drawing on the FRA, the NOE can be structured around four interconnected categories: Aims & Values, Engineering Practices, Methods & Methodological Rules, and Engineering Knowledge (Barak et al., 2024). This approach moves beyond viewing engineering merely as the direct application of science; rather, it highlights engineering's unique knowledge, values, and ways of operating (Antink-Meyer & Brown, 2019; Yesilyurt et al., 2024).

Central to this framework are the epistemic practices of engineering (EPE), which delineate the activities by which engineering knowledge claims are proposed, justified, and legitimized (Cunningham & Kelly, 2017; Hertel, Cunningham, & Kelly, 2017; Yesilyurt et al., 2024). EPE are defined as actions taken in the world that are patterned and concern the adjudication of knowledge claims, distinguishing them from a formalized philosophical epistemology (Cunningham & Kelly, 2017). Researchers have proposed a comprehensive set of EPE relevant for K–12 education, organized around themes such as finding solutions through creativity and innovation, utilizing data and evidence, employing tools and strategies for problem-solving, and addressing social contexts (Cunningham & Kelly, 2017; Yesilyurt et al., 2024). Examples of these practices include developing processes to solve problems, envisioning multiple solutions, making trade-offs between criteria and constraints, applying systems thinking, persisting and learning from failure, and working effectively in teams (Cunningham & Kelly, 2017).

Research confirms that engineering knowledge is distinct because it is empirical, solution-oriented, contextually responsive, social, and inherently

interdisciplinary (Antink-Meyer & Brown, 2019; Yesilyurt et al., 2024). Unlike science, which aims to generate generalizable knowledge, engineering focuses on the design and creation of artifacts—ranging from tangible machines and structures to software and design documents—to cater to specific human needs within particular constraints (Barak et al., 2024; Cunningham & Kelly, 2017; Yesilyurt et al., 2024). This pragmatic and bounded nature distinguishes it fundamentally from science (Wieselmann et al., 2021a).

3.The Three Dimensions of Engineering Learning

To establish coherence in P–12 engineering learning, current frameworks propose a three-dimensional approach to achieving engineering literacy: Engineering Habits of Mind, Engineering Practices, and Engineering Knowledge (Strimel et al., 2020).

1.Engineering Habits of Mind (EHoM): These are the traits or thinking strategies that influence how a learner approaches challenges, such as optimism, creativity, and persistence (Strimel et al., 2020). EHoM should be developed continuously through repetition starting in the early grades (Strimel et al., 2020). Creativity, for instance, is identified as a critical habit and the driving force behind innovative design, encompassing iteration, risk-taking, and learning from failure (Hegedus, 2014).

2.Engineering Practices: These are the skills and knowledge needed to competently act like an engineer (ASEE, 2020; Strimel et al., 2020). Core practices identified for P–12 education include Engineering Design, Materials Processing, Quantitative Analysis, and Professionalism (ASEE, 2020; Strimel et al., 2020). Engineering Design is fundamental, focused on devising new or improved artifacts and is characterized by key concepts such as design methods, project management, information gathering, and effective design communication (ASEE, 2020).

3.Engineering Knowledge: This dimension consists of scientific, mathematical, and technical concepts that students should recognize and be able to draw upon to inform their practices (Strimel et al., 2020). Knowledge concepts are viewed as auxiliary, leveraged to situate learning within authentic contexts and to support analytical, predictive, and practical problem-solving (ASEE, 2020; Strimel et al., 2020). These areas are broadly organized into Engineering Sciences, Engineering Mathematics, and Engineering Technical Applications (Strimel et al., 2020).

These three dimensions must be interwoven throughout curriculum and instruction to facilitate meaningful student learning (ASEE, 2020). Research confirms that scaffolding instruction from explicit development of EHoM in early grades toward teaching in-depth Engineering Knowledge in high school is a viable roadmap for achieving engineering literacy (Strimel et al., 2020). These three dimensions and their instructional focus are summarized in Table 1.

Table 1: *The Three Dimensions of Engineering Learning*

Dimension	Definition	Key Components	Educational Focus
Engineering Habits of Mind (EHoM)	Cognitive/affective traits shaping approaches to challenges	Creativity, optimism, persistence, collaboration, systems thinking	Cultivate enduring engineering mindset
Engineering Practices	Actions/skills to act as an engineer	Design, materials processing, quantitative analysis, professionalism	Engage in authentic engineering tasks
Engineering Knowledge	Conceptual/procedural understandings informing practice	Engineering science, mathematics, technical applications	Apply knowledge to contextual problems

Explanatory note: This table is adapted from ASEE (2020) and Strimel et al. (2020).

4.Engineering Design in Education

The Engineering Design Process (EDP) is widely recognized as the fundamental activity of engineering, integrating knowledge, skills, and habits of mind (ASEE, 2020; Barak et al., 2024; Sung & Kelley, 2022). It serves as a central practice in STEM education, guiding students and educators in engineering learning (Sung & Kelley, 2022).

4.1. The Nature of the Design Process

While the Engineering Design Process (EDP) is often presented instructionally as a structured, sequential process (e.g., *Ask, Imagine, Plan, Create, Improve*), experts emphasize that in real-world practice, it is fundamentally non-linear, cyclical, and iterative, often involving "jumping around from step to step" (Hynes et al., 2011; Sung & Kelley, 2022). This iterative characteristic is vital, as effective design requires continually revising initial plans, testing prototypes, and learning from failures (Sung & Kelley, 2022; Wendell, Wright, & Paugh, 2017).

The successful execution of the EDP relies heavily on problem-solving, which in engineering is often aimed at addressing specific challenges rather than the knowledge-generation goals of science (Cunningham & Kelly, 2017). This process involves developing multiple viable solutions, considering constraints and criteria, and making calculated trade-offs (Cunningham et al., 2020; Cunningham & Kelly, 2017; Wendell, Wright, & Paugh, 2017). For instance, curricula such as *Engineering is Elementary (EiE)* explicitly include components where students must identify problems with clear specifications and constraints that necessitate making trade-offs (Cunningham et al., 2020).

The Engineering Design Process provides students with structured opportunities to develop these practices through stages such as *Ask, Imagine, Plan, Create,* and *Improve*, fostering systematic habits of mind and iterative thinking (YES™, 2023). Rather than following a rigid or linear path, students

are encouraged to move flexibly among stages as they test ideas, evaluate outcomes, and refine their designs. Once they complete an initial design, they assess and improve their work, effectively re-entering the design cycle and engaging in a continuous process of reflection and growth (YES™, 2023).

In the *Engineering Everywhere (EE)* curriculum, this framework is expanded to include seven stages—*Define the problem, Research, Imagine, Plan, Create, Test,* and *Evaluate*—to better align with the developmental levels and cognitive capacities of middle school learners. As illustrated in Figure 1, students at this level engage in a seven-phase iterative process that supports deeper conceptual understanding and the development of authentic engineering practices (YES™, 2023).

Figure 1. *Iterative Engineering Design Process*
Explanatory note: This figure is reprinted from YES™ (2023). All rights reserved.

4.2. Reflective Decision-Making and Epistemic Criteria

Engagement in the EDP naturally fosters complex cognitive processes, particularly reflective decision-making (RDM), which is crucial for elementary students participating in design challenges (Sung & Kelley, 2022; Wendell, Wright, & Paugh, 2017). RDM involves articulating multiple potential solutions, evaluating the pros and cons of each based on data, and intentionally selecting the optimal solution (Wendell, Wright, & Paugh, 2017). Students move through these stages by referring to the data they collected and achieving group consensus on the best approach before proceeding to prototyping (Wendell, Wright, & Paugh, 2017).

Furthermore, students employ various epistemic criteria—the standards used to justify or assess knowledge claims—when arguing for design solu-

tions (Baze et al., 2023). These criteria exist on a continuum, ranging from goals important to the school context ("doing school") to goals aligned with professional engineering practice ("doing engineering") (Baze et al., 2023; Jiménez-Aleixandre et al., 2000 cited in Baze et al., 2023). For example, complex epistemic practices in engineering often require students to justify their decisions using multiple sources of information, an approach often distinct from simpler school-oriented goals (Baze et al., 2023). In authentic engineering design, criteria related to innovation, optimization, and considering the community's needs are particularly important (Baze et al., 2023).

5.Pedagogical Approaches

Effective engineering instruction requires pedagogical approaches that actively engage students in the disciplinary discourse and utilize tools that structure their complex problem-solving activities (Cunningham et al., 2020; Hertel, Cunningham, & Kelly, 2017).

5.1. The Role of Argumentation and Evidence-Based Reasoning

One of the most critical instructional goals is enabling students to engage in meaningful disciplinary discourse (Cunningham & Kelly, 2017; Hertel, Cunningham, & Kelly, 2017). In engineering, this often manifests as evidence-based reasoning (EBR), where students support a design idea or decision (the claim) with data or justification (Siverling et al., 2021). Opportunities for argumentation and EBR are provided when engineering challenges require students to build arguments, often through reflection or presentation of results, to justify their choices (Baze et al., 2023; Crismond & Adams, 2012; Mathis et al., 2017; Siverling et al., 2021).

Research identifies several situations that prompt students to use EBR: those directly prompted by the teacher or an adult (e.g., asking "why" or recommending the use of data) and those directed by the students themselves (Siverling et al., 2021). Teacher-prompted EBR often occurs when the need arises to document decisions, such as recording answers in an engineering notebook or compiling a final communication to a client (Mathis et al., 2017; Siverling et al., 2021). Student-directed EBR frequently emerges during group negotiations, where teammates challenge a design idea and prompt a defense backed by evidence (Siverling et al., 2021). This practice highlights the centrality of evidence for decision-making within the discipline (Cunningham & Kelly, 2017).

5.2. Engineering Notebooks and Documentation

Engineering notebooks serve as vital scaffolding tools in the classroom, helping students organize their collective actions, document data, structure their activities, and facilitate disciplinary discourse (Hertel, Cunningham, & Kelly, 2017; Han, Park, & Kelley, 2023). For young learners, in particular, notebooks provide explicit guidance on the EDP steps, directing their attention to salient features, collecting specific types of data, and necessitating reflection

on their results (Hertel, Cunningham, & Kelly, 2017). The use of notebooks in documenting design processes and reasoning is essential, as this practice reinforces the idea that engineering knowledge is built and distributed through careful written and schematic documentation (Hertel, Cunningham, & Kelly, 2017; Han, Park, & Kelley, 2023).

Writing tasks embedded within engineering challenges are highly motivational because they are integrated directly into the activity of the student groups (Hertel, Cunningham, & Kelly, 2017). Students are motivated to document their plans, sketches, and schematics accurately, especially when their documented design must be comprehensible enough for another group to build or test it (Hertel, Cunningham, & Kelly, 2017). For example, analyzing student discourse in robotics units revealed an increase in the frequency of terms like *build* and *programming* across tasks, suggesting active engagement in these core activities (Ardito, Czerkawski, & Scollins, 2020). Digital platforms, such as *EngiNotebook*, further enhance this process by providing collaborative tools for sketching, note-taking, and documenting design decisions based on explicit constraints and criteria (Han, Park, & Kelley, 2023).

5.3. Designing for Student Learning

Successful engineering curriculum models, such as *Engineering is Elementary* (EiE), demonstrate that pedagogical approaches matter significantly in maximizing learning outcomes (Cunningham et al., 2020). The study of EiE showed that students achieved better outcomes in both science and engineering content when instruction favored approaches where students generated their own explanations, rather than those relying heavily on teacher explanations (Cunningham et al., 2020). Furthermore, high-quality use of engineering journals and active engagement in disciplinary discourse led to improved learning (Cunningham et al., 2020; Hertel, Cunningham, & Kelly, 2017). These findings underscore that engineering education must actively involve students in the discourses of science and engineering and leverage specific epistemic tools (Cunningham et al., 2020).

Elementary engineering units often follow a structured approach, typically including a preparatory lesson, a multicultural story introducing the engineering field, materials testing to gather scientific data, and a final design challenge where the EDP is enacted (Hester & Cunningham, 2007; Hegedus, 2014). Curricular materials often provide supports at different complexity levels (basic and advanced) to accommodate diverse student populations (Hester & Cunningham, 2007; Cunningham et al., 2020).

6.Current Challenges and Future Directions

Despite the increasing integration of engineering into K–12 education, several critical challenges remain, particularly concerning equity, teacher preparation, and the ongoing conceptualization of the discipline.

6.1. Addressing Equity and Social Dynamics

A central guiding principle for engineering education programs is maintaining equity at the forefront, ensuring all students have the opportunity to develop engineering literacy (ASEE, 2020). Researchers recognize that engineering has the potential to foster equity by challenging traditional classroom hierarchies that often privilege only mathematical and verbal abilities (Wendell, Wright, & Paugh, 2017; Hegedus, 2014). Incorporating engineering design projects situated in real-life problems and local community needs further allows students to leverage their diverse expertise and cultural assets (Parker, 2022; Baze et al., 2023).

However, research into collaborative small-group dynamics reveals persistent gendered patterns that can undermine equitable participation. Studies have observed instances where boys exert disproportionate control over materials and direct their peers more frequently during engineering challenges compared to science activities (Wieselmann et al., 2020). In mixed-gender groups, girls sometimes expressed feeling relegated to "boring" tasks like record-keeping, while boys monopolized the "fun" tasks of manipulation and physical building (Wieselmann et al., 2020). This dynamic, where students fall into traditional gender roles, can suppress girls' ideas and confidence during the critical engineering phase (Wieselmann et al., 2021a; Wieselmann et al., 2020). Addressing these issues requires long-term commitments from educational stakeholders to build a culture that values diverse perspectives and promotes culturally situated learning experiences (Wieselmann et al., 2021a).

Furthermore, students' preconceptions about what an engineer is and does can be narrow or stereotypical, often aligning engineers with roles like laborers or mechanics, underscoring the necessity of curriculum that explicitly broadens these conceptions starting in elementary school (Capobianco et al., 2011; Simarro & Couso, 2021).

6.2. Teacher Capacity and Professional Development

The successful integration of engineering into K–12 education is constrained by the fact that most elementary and secondary teachers lack formal engineering education and experience (Barak et al., 2024; Cunningham & Kelly, 2017; Moore et al., 2014; NASEM, 2020). To build capacity for teaching engineering, teacher education programs must address the essential qualities of engineering, the design process, and core concepts (NASEM, 2020). This requires moving beyond merely teaching the propositional knowledge of engineering to focusing on how problems are solved through practice and engaging teachers in the epistemic practices themselves (Cunningham & Kelly, 2017).

Recommendations from the National Academies suggest holding collaborative dialogues among experts from colleges of education, engineering, and other stakeholders to support the development of deep pedagogical content knowledge in engineering (NASEM, 2020; Strimel et al., 2020). Teachers need specific professional learning experiences focused on instructional strategies such as facilitating brainstorming best practices, teaching students to view failure

productively, and highlighting the social value inherent in engineering design (Hegedus, 2014).

6.3. Future Conceptualization and Research

The future direction of engineering education requires continuous refinement of its epistemological foundations and content structures. Efforts to establish a coherent content taxonomy for P–12 engineering learning have led to consensus among experts on core concepts related to engineering knowledge and practices (Strimel et al., 2020). This rigorous taxonomy aims to provide a clear roadmap for developing educational standards, performance expectations, and learning progressions that sequence knowledge across grade levels, building from Habits of Mind in early grades to in-depth Knowledge in high school (Strimel et al., 2020).

Future research must continue to empirically validate these emerging frameworks, examining how various epistemic criteria interact during the design process and identifying the most effective ways to introduce and sequence engineering concepts for different learners (Baze et al., 2023; Strimel et al., 2020). Furthermore, researchers must continue to explore the synergy in learning and teaching engineering alongside mathematics and science, ensuring that engineering is valued not just as a support mechanism for science learning, but as a discipline offering unique ways of knowing and problem-solving (Cunningham & Kelly, 2017; Strimel et al., 2020). The integration of care and ethical considerations—aspects often underemphasized in standards—must also be prioritized to cultivate socially conscious future engineers (Yesilyurt et al., 2024; Yesilyurt et al., 2024).

7.Conclusion

Reimagining engineering education necessitates an epistemologically rigorous and pedagogically intentional approach, grounded in the distinctive nature of engineering as a discipline focused on creative problem-solving and artifact creation (Barak et al., 2024; Cunningham & Kelly, 2017). The core practice of the Engineering Design Process, when taught as an iterative, evidence-based process, enables students to develop essential Engineering Habits of Mind and engage in critical epistemic practices, such as reflective decision-making and argumentation (Siverling et al., 2021; Wendell, Wright, & Paugh, 2017). Utilizing tools like structured engineering notebooks supports this complex intellectual work by scaffolding documentation and facilitating collaborative discourse (Hertel, Cunningham, & Kelly, 2017). While challenges related to equitable group dynamics and teacher preparedness persist, the development of cohesive, three-dimensional frameworks for engineering literacy provides a strong foundation for future curricula and instructional initiatives (Strimel et al., 2020). By prioritizing authenticity, equity, and a deep understanding of the NOE, educators can ensure that every child gains the opportunity to think, learn, and act like an engineer, fostering a technically proficient and informed citizenry for the future (Strimel et al., 2020).

REFERENCES

American Society for Engineering Education. (2020). *Framework for P–12 engineering learning: A defined and cohesive educational foundation for P–12 engineering*. https://doi.org/10.18260/1-100-1153-1

Antink-Meyer, A., & Arias, A. M. (2022). Teachers' Incorporation of Epistemic Practices in K-8 Engineering and Their Views About the Nature of Engineering Knowledge. *Science & Education*, *31*(2), 357–382. https://doi.org/10.1007/s11191-021-00265-4

Antink-Meyer, A., & Brown, R. A. (2019). Nature of Engineering Knowledge. *Sci & Educ* 28, 539–559. https://doi.org/10.1007/s11191-019-00038-0

Ardito, G., Czerkawski, B., & Scollins, L.. (2020). Learning Computational Thinking Together: Effects of Gender Differences in Collaborative Middle School Robotics Program. *Techtrends*, *64*(3), 373–387. https://doi.org/10.1007/s11528-019-00461-8

Barak, M., Ginzburg, T., & Erduran, S. (2024). Nature of Engineering. *Science & Education*, *33*(3), 679–697. https://doi.org/10.1007/s11191-022-00402-7

Baze, C., González-Howard, M., Sampson, V., Fenech, M., Crawford, R., Hutner, T., Chu, L., & Hamilton, X. (2023). Understanding student use of epistemic criteria in engineering design contexts. *Science Education*, *107*(4), 1033–1067. https://doi.org/10.1002/sce.21795

Capobianco, B. M., Diefes-Dux, H. A., Mena, I., & Weller, J.. (2011). What is an Engineer? Implications of Elementary School Student Conceptions for Engineering Education. *Journal of Engineering Education*, *100*(2), 304–328. https://doi.org/10.1002/j.2168-9830.2011.tb00015.x

Carr, R. L., Bennett, L. D., & Strobel, J. (2012). Engineering in the K-12 STEM standards of the 50 U.S. states: An analysis of presence and extent. *Journal of Engineering Education*, *101*(3), 539–564. https://doi.org/10.1002/j.2168-9830.2012.tb00061.x

Cunningham, C. M., & Carlsen, W. S. (2014). Teaching Engineering Practices. *Journal of Science Teacher Education*, *25*(2), 197–210. https://doi.org/10.1007/s10972-014-9380-5

Cunningham, C. M., & Kelly, G. J. (2017). Epistemic Practices of Engineering for Education. *Science Education*, *101*(3), 486–505. https://doi.org/10.1002/sce.21271

Cunningham, C. M., Lachapelle, C. P., Brennan, R. T., Kelly, G. J., San Antonio Tunis, C., & Gentry, C. A. (2020). The impact of engineering curriculum design principles on elementary students' engineering and science learning. *Journal of Research in Science Teaching*, *57*(3), 423–453. https://doi.org/10.1002/tea.21601

Crismond, D. P., & Adams, R. S. (2012). The informed design teaching and learning matrix. *Journal of Engineering Education*, *101*(4), 738–797. https://doi.org/10.1002/j.2168-9830.2012.tb01127.x

Han, S. H., Park, C. H., & Kelley, T. R. (2023). Developing an engineer's notebook application for collaborative engineering design in P-12 education. *Journal of Pre-College Engineering Education Research (J-PEER)*, *13*(1), 1–11.

Hertel, J. D., Cunningham, C. M., & Kelly, G. J. (2017). The roles of engineering notebooks in shaping elementary engineering student discourse and practice. *International Journal of Science Education*, *39*(9), 1194–1217. https://doi.org/10.1080/09500693.2017.1317864

Hester, K., & Cunningham, C. (2007). *Engineering is elementary: An engineering and technology curriculum for children*. Paper presented at the American Society for Engineering Education Annual Conference & Exposition, Honolulu, HI.

Hynes, M., Portsmore, M., Dare, E., Milto, E., Rogers, C., Hammer, D. & Carberry, A. (2011). "Infusing Engineering Design into High School STEM Courses". *Publications*. Paper 165. https://digitalcommons.usu.edu/ncete_publications/165

Kaya, E., & Erduran, S. (2016). From FRA to RFN, or how the family resemblance approach can be transformed for science curriculum analysis on nature of science. *Science & Education*, *25*(9–10), 1115–1133. http://dx.doi.org/10.1007/s11191-016-9861-3

Mathis, C. A., Siverling, E. A., Glancy, A. W., & Moore, T. J. (2017). Teachers' incorporation of argumentation to support engineering learning in STEM integration curricula. *Journal of Pre-College Engineering Education Research*, *7*(1), 76–89. https://doi.org/10.7771/2157-9288.1163

Moore, T. J., Glancy, A. W., Tank, K. M., Kersten, J. A., Smith, K. A., & Stohlmann, M. S. (2014). A framework for quality K–12 engineering education: Research and development. *Journal of Pre-College Engineering Education Research*, *4*(1), 1–13. https://doi.org/10.7771/2157-9288.1069

National Academies of Sciences, Engineering, and Medicine. (2020). *Building capacity for teaching engineering in K-12 education*. The National Academies Press. https://doi.org/10.17226/25612

NGSS Lead States. (2013). *Next Generation Science Standards: For states, by states*. The National Academies Press.

Parker, M. E. (2022). *The incorporation of and engagement in engineering design in high school biology* [Doctoral dissertation]. University of Illinois at Urbana-Champaign. Retrieved from https://www.proquest.com/dissertations-theses/incorporation-engagement-engineering-design-high/docview/2723835827/se-2

Pleasants, J. (2023). Rethinking the Nature of Engineering: Attending to the Social Context of Engineering. Science & Education. 33. 1353-1370. 10.1007/s11191-023-00445-4

Pleasants, J., & Olson, J. K.. (2019). What is engineering? Elaborating the nature of engineering for K-12 education. *Science Education*, *103*(1), 145–166. https://doi.org/10.1002/sce.21483

Simarro, C., & Couso, D. (2021). Towards a more comprehensive account of engineering practices: The Engineering Practices Framework. *IJ STEM Education*, *8*(1), 1–12. https://doi.org/10.1186/s40594-021-00301-3

Siverling, E. A., Moore, T. J., Suazo-Flores, E., Mathis, C. A., & Guzey, S. S. (2021). What initiates evidence-based reasoning?: Situations that prompt students to support their design ideas and decisions. *Journal of Engineering Education*, *110*(2), 294–317. https://doi.org/10.1002/jee.20384

Strimel, G., Huffman, T., Grubbs, M., Kim, E., & Gurganus, J. (2020). Establishing a content taxonomy for the coherent study of engineering in P-12 schools. *Journal of Pre-College Engineering Education Research (J-PEER)*, *10*(1), 23–59. https://doi.org/10.7771/2157-9288.1232

Sung, E., & Kelley, T. R.. (2022). Elementary Students' Engineering Design Process: How Young Students Solve Engineering Problems. *International Journal of Science and Mathematics Education*, *21*(5), 1615–1638. https://doi.org/10.1007/s10763-022-10317-y

Hegedus, T. (2014). *Engineering education for youth: Diverse elementary school students' experiences with engineering design* [Doctoral dissertation]. The University of North Carolina. Retrieved from https://www.proquest.com/dissertations-theses/engineering-education-youth-diverse-elementary/docview/1652500616/se-2

Vanderhoof, C. M.. (2018). *Multimodal Analysis of Decision Making in Elementary Engineering* (pp. 48–72). https://doi.org/10.4324/9781351139922-3

Wendell, K. B., Wright, C. G., & Paugh, P.. (2017). Reflective Decision-Making in Elementary Students' Engineering Design. *Journal of Engineering Education*, *106*(3), 356–397. https://doi.org/10.1002/jee.20173

Wieselmann, J. R., Dare, E. A., Ring-Whalen, E. A., & Roehrig, G. H.. (2020). "I just do what the boys tell me": Exploring small group student interactions in an integrated STEM unit. *Journal of Research in Science Teaching*, *57*(1), 112–144. https://doi.org/10.1002/tea.21587

Wieselmann, J. R., Dare, E. A., Roehrig, G. H., & Ring-Whalen, E. A.. (2021a). "There are other ways to help besides using the stuff": Using activity theory to understand dynamic student participation in small group science, technology, engineering, and mathematics activities. *Journal of Research in Science Teaching*, *58*(9), 1281–1319. https://doi.org/10.1002/tea.21710

Yesilyurt, E., Deniz, H., & Kaya, E. (2024). Exploring epistemic aspects of engineering for K–12 science and engineering education. *Journal of Engineering Education*, *113*(2), 439–467. https://doi.org/10.1002/jee.20593

Youth Engineering Solutions™. (2023). *Engineering vertical farms*. Boston, MA: Museum of Science. https://www.eie.org/engineering-everywhere

ABOUT THE AUTHOR

Semra TANRIÖVER is a Science Teacher at the Ministry of National Education and currently works at the Science and Art Center (BİLSEM) in Antalya, Türkiye. She has a master's degree in Science Education and is pursuing her Ph.D. in the same field at Hacettepe University. Her scholarly and professional interests include engineering education, STEM integration, epistemic practices, argumentation, biomimicry-based design, and sustainability education.

She actively mentors middle school students in national and international research and innovation competitions, including TÜBİTAK project programs, and has led numerous STEM and engineering design-based learning projects. She also conducts research on the Engineering Everywhere (EE) curriculum, engineering identity development, and socio-scientific reasoning. Additionally, she produces scientific content for educational platforms and provides private lessons.

Similarity Index

The similarity index obtained from the plagiarism software for this book chapter is 9%.

To Cite This Chapter

Tanrıöver, S., (2025). Reimagining Engineering Education: Pedagogical Foundations and Future Directions. In O. Çardak (Ed.), *Current Studies in Educational and Social Sciences 2025* (pp. 69-81). ISRES Publishing.

GLOBAL RESEARCH TRENDS IN VALUES EDUCATION: A BIBLIOMETRIC ANALYSIS (2004–2025)

Mucahit KOSE
Alanya Alaaddin Keykubat University Education Faculty
E-mail: mucahit.kose@alanya.edu.tr
ORCID: 0000-0002-1938-6092

Reha ATAS
Ministry of Education
E-mail: rehatas86@gmail.com
ORCID: 0000-0003-0891-3851

Introduction

Values are beliefs and norms that guide individuals and shape their attitudes and behaviors (Demircioğlu & Tokdemir, 2008). These norms, which regulate human conduct, also contribute to the formation of social structure. According to Snyder (1997), values play a crucial role in defining individual behavior. As constructs that organize both interpersonal relations and personal behavior patterns, values give meaning to individuals' lives (Berkowitz, 2011). In this sense, socially accepted values not only protect social cohesion but also guide individual actions, enabling harmonious life within society.

Education serves as the primary mechanism through which individuals internalize societal values. Beginning in the family and continuing through formal schooling, the educational process fosters the development of both personal and social identity. Through this process, individuals learn their social status and roles, thereby adapting to society. Thus, values can be seen as foundational to maintaining social order. The literature features various classifications of values, shaped by philosophical, sociological, and psychological perspectives. Among the most influential are those proposed by Spranger, Rokeach, Schwartz, and Kahle.

Rokeach (1973) categorizes values into two main types: terminal and instrumental. These interrelated categories collectively shape an individual's overall life orientation. Spranger (1914) offers a broader, humanistic typology, classifying values into six types: theoretical, economic, aesthetic, social, political, and religious (Schwartz & Bilsky, 1990). Schwartz's value theory is widely regarded as one of the most comprehensive models in the field. Based on individuals' motivational goals, Schwartz groups values into ten fundamental dimensions: security, tradition, conformity, achievement, hedonism, universa-

lism, self-direction (autonomy), stimulation, power, and benevolence (Sagiv & Schwartz, 2022). Lastly, Kahle's (1985) List of Values emphasizes individuals' relationship with their social environment and overall life satisfaction, highlighting elements such as belonging, self-respect, security, enjoyment of life, close relationships, social recognition, success, and personal growth.

Values that foster self-actualization vary across cultural and social contexts, making their intergenerational transmission essential for preserving a society's identity. Here, education assumes a central role**.** Values education stands as a core component of modern education systems. The family serves as its first and most fundamental stage. Beginning in the home and extending through school and the wider social environment, values education plays a critical role in an individual's holistic development. Schools, where individuals spend a substantial portion of their formative years, bear particular responsibility in this process. The transmission of national, moral, social, and cultural values is essential not only for character formation but also for nurturing democratic participation, social cohesion, global citizenship, and ethical responsibility. In this sense, values constitute the foundation upon which individuals reflect their culture, beliefs, and virtuous conduct in their behavior. Consequently, values education remains a priority in both national curricula and international educational agendas.

The rise in values education research between 2004 and 2025 is closely tied to transformations in educational policy. Shifts in social structures, digitalization, migration, cultural diversity, globalization, and ongoing debates on social justice have prompted scholars to examine not only values education but also related concepts—such as citizenship education, global citizenship, identity, curriculum, democracy, and diversity—with increasing frequency.

For instance, Karasu Avcı et al. (2020) emphasize that effective citizenship is built upon core values like patriotism, responsibility, honesty, respect, equality, and diligence, and they identify Social Studies courses as a crucial medium for instilling these values in students. In the international literature, Hartman (2013) contends that democratic citizenship can be sustained only through the deliberate cultivation of fundamental democratic values—freedom, equality, human dignity, other-regarding orientations, and social responsibility—via education. Hagh (2020) similarly observes that an inclusive and diversity-sensitive curriculum reinforces the development of essential values such as tolerance, respect, equality, and human dignity, arguing that values education must therefore be integrated into curricular design.

Studies by Suri and Chandra (2021) underscore the role of values education in promoting social cohesion, character integrity, and multicultural awareness. Silva et al. (2025) likewise highlight that fostering democratic and ethical values requires the creation of inclusive, equitable learning environments that encourage active student participation. Further research (McCune, 2021) shows that values not only shape individual attitudes but also cultivate a sense of social responsibility, leading even academics to frame their teaching identities in higher education around ethical and moral principles.

Collectively, this literature affirms that values education occupies a central place in teacher preparation and that its effectiveness depends on teachers' ability to internalize core values and model them in their professional conduct and classroom practice.

In today's digital era—marked by rising hate speech and polarized media content—education systems face a growing imperative to cultivate citizens who are just, conscientious, respectful of human dignity, participatory, and oriented toward active justice (Westheimer, 2019). The literature shows that research in the field of values education predominantly focuses on themes including core values, global citizenship, peace and democratic values, character education, ethical sensitivity, inclusion, intercultural understanding, digital citizenship, and social justice.

Therefore, a systematic analysis of publication trends—including annual and thematic distributions, the most prolific authors, citation bursts, author countries, national scientific productivity, the most highly cited works, and frequently used keywords—will illuminate the developmental trajectory of the values education literature. Such an analysis will not only map the current state of the field but also provide a foundation for guiding future research.

The overarching aim of this study is to examine, through a bibliometric lens, the scientific orientations, thematic concentrations, research trends, conceptual emphases, and developmental progression of national and international publications on values education between 2004 and 2025. Specifically, the study seeks to identify prominent themes in the literature, trace their conceptual linkages, determine the key researchers and institutions shaping the field, analyze shifts in publication volume over time, and outline potential directions for future inquiry. Bibliometric studies (Karaca & Kılcan, 2023; Köse, 2021; Kurtuluş & Bilen, 2021; Pradana et. al., 2023) conducted across various subject areas are widely represented in the literature.

Method

This study adopts a descriptive research design. The bibliometric characteristics of journal articles were identified by searching the Web of Science database using the keywords: "values education," "character education," "moral education," "virtue education," "ethical education," "citizenship education," "values-based education," and "peace education." These keywords were selected to capture data on articles related to values education across diverse contexts and cultures. Bibliometric analyses conducted within the framework of descriptive research allow for the characterization of research in a given field and provide insights into publication trends. Furthermore, such analyses offer researchers a comprehensive overview of the thematic areas in which studies have been conducted. Bibliometric analysis is widely regarded as a highly effective method for identifying and evaluating contributions from countries, institutions, subject areas, journals, and specific research topics (Huang, Ho, & Chuang, 2006).

Sampling

The research data comprise articles related to the specified key concepts, published in various Web of Science-indexed journals between 2004 and 2025. The database search excluded document types such as books, book chapters, conference papers, reviews, editorials, and letters to ensure a focused analysis of primary research articles.

Although the first relevant article in Web of Science dates back to 1980, publications from 1980 to 2004 represent less than 6% of the total corpus. Studies prior to 2004 are scarce, conceptually underdeveloped, and low in publication density, thus failing to form a statistically meaningful trend. Therefore, the analysis begins in 2004, marking the field's substantive emergence and growth. Conversely, 2025 represents the most recent full year of available publications at the time of data collection. This timeframe (2004–2025) was selected because it provides both a conceptually coherent starting point and a methodologically comprehensive, up-to-date scope, capturing nearly two decades of scholarly development alongside contemporary trends.

Publications up to 2025 include only those released on or before 13 November; articles published after this date and any early-access items dated 2026 were excluded.

In bibliometric research, key data sources include international citation indices such as the Social Sciences Citation Index (SSCI), Science Citation Index Expanded (SCI-EXPANDED), Emerging Sources Citation Index (ESCI), and the Arts & Humanities Citation Index (A&HCI). The Web of Science database was chosen for this study because it provides integrated access to these indices and is fully compatible with the bibliometric analysis system operated through the R-Studio environment.

Data Collection

This study began with a comprehensive literature review to identify key concepts synonymous with "values education." The relevance of these concepts to the field was assessed by two subject-matter experts specializing in values education research. Incorporating their feedback, a systematic database search was conducted, yielding an initial 1,570 records. After applying publication-type and time-range filters consistent with the study’s objectives, 1,329 articles were retained for analysis. For these articles, the following bibliometric indicators were examined: annual publication trends, average citation counts, most active journals and authors, citation bursts, h-index values, country-level scientific productivity, most-cited sources, collaboration networks, word clouds and thematic maps, and conceptual structure maps.

Data Analysis

To obtain the findings related to the screened publications, the R-Studio software environment was utilized. R provides access to a wide range of packages used in bibliometric analyses through its official repository at https://cran.r-

project.org/. These packages offer substantial advantages for quantitative research in bibliometrics (Aria & Cuccurullo, 2017). The R environment was preferred for conducting bibliometric analyses due to its capacity to generate extensive and detailed results. The data file, prepared according to the criteria of the study from the Web of Science database, was exported by selecting "All," followed by export → bibtex, and including the options "citation information," "bibliographical information," "abstract & keywords," "funding details," and "other information." Subsequently, the "bibliometrix" package was installed and activated in R-Studio. After running the bibliometrix package, R-Studio automatically directed the user to the bibliometric analysis interface. The "bibtex" file was then uploaded to the data section, and all analyses were carried out accordingly.

Findings

Information regarding the 1329 publications related to values education is presented in Table 1 by year, while the changes in annual publication numbers are illustrated in Figure 1.

Table 1: *Number and Percentage of Publications by Year*

Year	Article count	Percentage (%)
1980-1995	36	2.55
1996-2003	46	3.26
2004-2005	32	2.27
2006-2007	56	3.97
2008-2009	93	6.59
2010-2011	104	7.37
2012-2013	100	7.08
2014-2015	94	6.66
2016-2017	127	8.99
2018-2019	173	12.25
2020-2021	165	11.69
2022-2023	191	13.53
2024-2025	195	13.81

ISBN: 978-625-6959-98-9

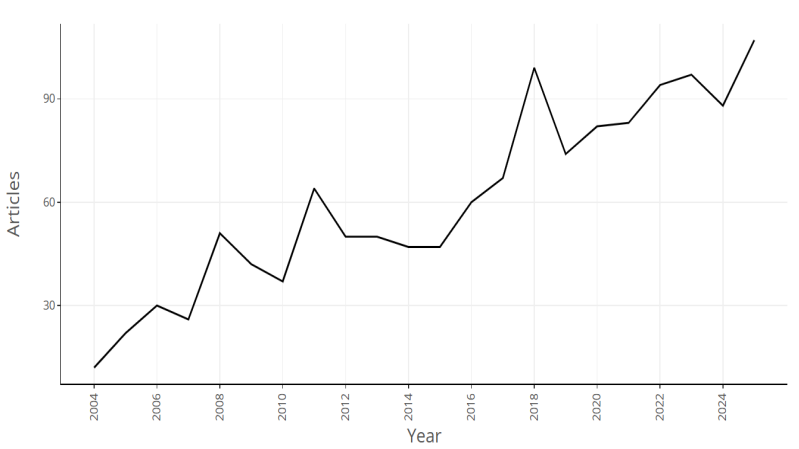


Figure 1: *Annual Change in the Number of Publications*

An examination of Table 1 and Figure 1 shows that publications related to values education first appeared in 1980; however, a notable increase in the annual number of articles began in 2004. The highest number of publications in the field was recorded between 2024 and 2025 (f = 195). It is also observed that works published after 2004 account for 94.19% of all publications, while those published since 2010 constitute 81.44% of the total. The average number of citations related to the field is presented in Figure 2.

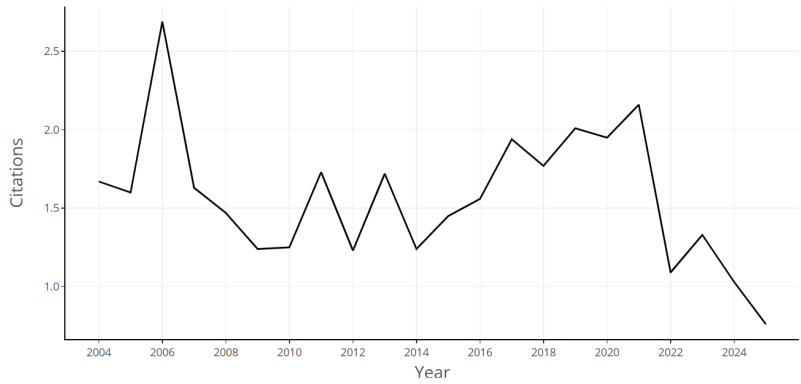


Figure 2: *Graph of Annual Changes in Average Citations*

An examination of Figure 2 shows that the highest annual average citation count occurred in 2006. Figure 3 illustrates the journals in which authors have published their work based on the central key concept.

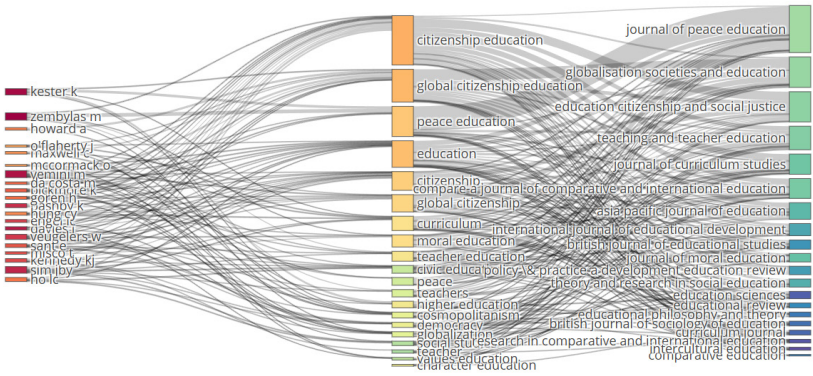


Figure 3: *Tree Field Plot (Keywords- Authors- Journals)*

An examination of Figure 3 shows that different groups of authors publish in specific journals depending on the focal key concepts. Distinct clusters emerge around areas such as democratic and global citizenship, peace education and justice, as well as moral and character education. Figure 4 presents the top 20 journals with the highest number of publications.

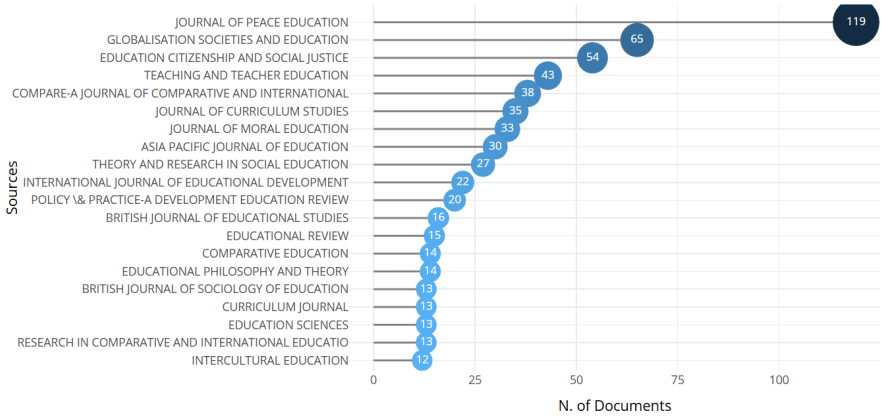


Figure 4: *Journals with the Highest Number of Publications in the Field*

An examination of Figure 4 reveals that the journals with the highest number of published articles are *Journal of Peace Education* (f = 119), *Globalisation, Societies and Education* (f = 65), and *Education, Citizenship and Social Justice* (f = 54). Figure 5 presents the authors who have produced the greatest number of articles related to the topic.

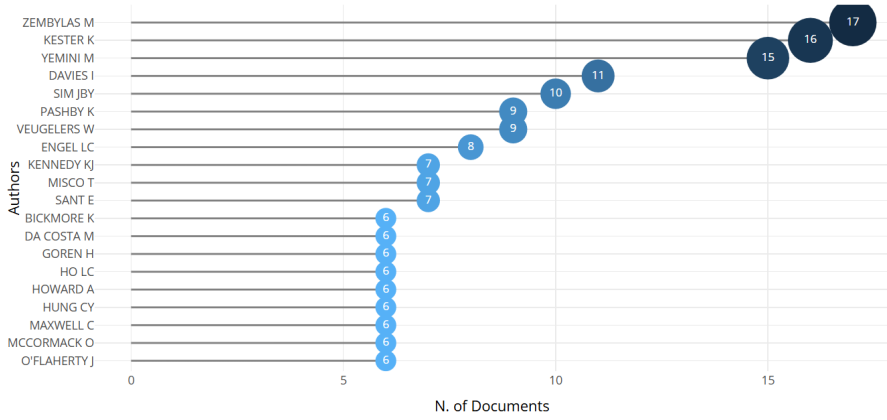


Figure 5: *Authors with the Highest Number of Publications in the Field*

An analysis of Figure 4 indicates that a total of 1329 publications—produced either collaboratively or individually—are associated with the field. The average number of articles per author is 0.602, while the average number of authors per article is 1.65. The authors with the highest number of publications on values education are M. Zembylas (f = 17), K. Kester (f = 16), and M. Yemini (f = 15). These researchers are affiliated with the Open University of Cyprus, Keimyung University in South Korea, and Tel Aviv University, respectively. Figure 6 presents the citation burst values of the authors.

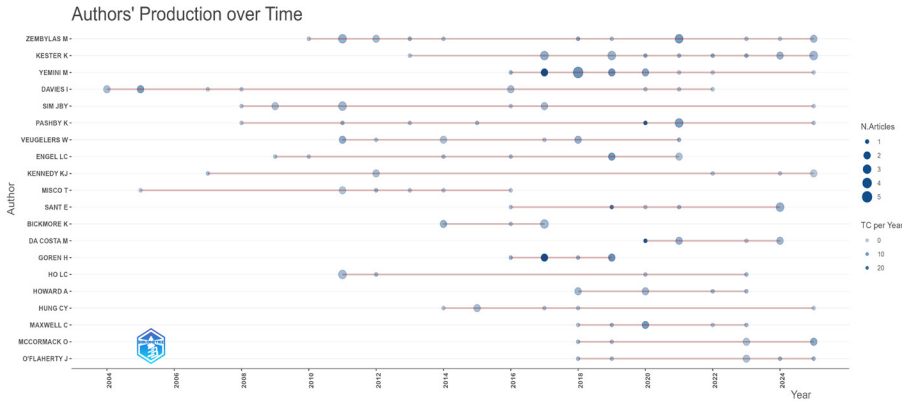


Figure 6: *Authors' Citation Burst Values*

An examination of the authors' citation burst values shows that the authors with the strongest citation bursts are M. Yemini (60.89) during the period 2008–2020 and J. Baumert during 2008–2015. Although Kunter and Baumert may not be the most highly cited authors overall, their citation bursts result from receiving a concentrated number of citations within a specific time interval. It is also observed that M. Zembylas (2010–2025) and I. Davies (2004–2022) have significantly shaped the field over long periods, as evidenced by their uninterrupted citation activity across these years. Table 2 presents the top four authors with the highest citation burst values.

Table 2. *Citation Burst Values and Start–End Periods by Author*

Authors	Citation Burst Scores	Years
YEMINI M	27.77	2010-2025
GOREN H	27.77	2016-2019
PASHBY K	24.83	2008-2025
DA COSTA M	24.88	2020-2024

An examination of the names listed in Table 2 indicates that the authors exhibit notably high citation burst values. Figure 7 presents the countries of the corresponding authors.

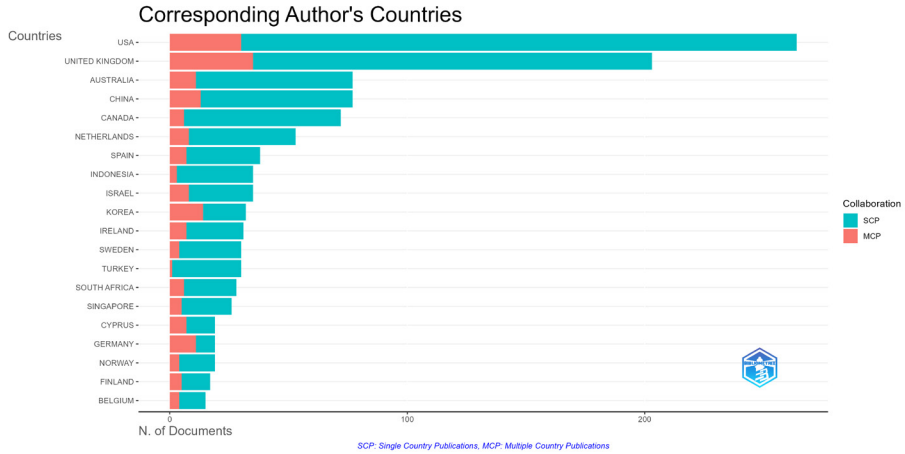


Figure 7*: Countries of Corresponding Authors and Number of Articles*

An examination of Figure 7 shows the countries of the corresponding authors who conducted the studies. The section labeled SCP (Single Country Publications) represents publications produced by researchers from the same country, whereas the MCP (Multiple Country Publications) section indicates publications co-authored by researchers from more than one country. Considering the distribution of corresponding authors by country, the United States ranks first with a total of 264 articles (SCP: 234, MCP: 30), followed by the United Kingdom with 203 articles (SCP: 168, MCP: 35), and Australia (SCP: 66, MCP: 11) and China (SCP: 64, MCP: 13) with 77 articles each, which together represent the top three positions (Table 3).

ISBN: 978-625-6959-98-9

Table 3. *Number of Articles by Country, and SCP–MCP Values*

Country	Articles	Articles %	SCP	MCP	MCP %
USA	264	19.8645598	234	30	11.3636364
UNITED KINGDOM	203	15.2746426	168	35	17.2413793
AUSTRALIA	77	5.79382995	66	11	14.2857143
CHINA	77	5.79382995	64	13	16.8831169
CANADA	72	5.41760722	66	6	8.33333333
NETHERLANDS	53	3.98796087	45	8	15.0943396
SPAIN	38	2.8592927	31	7	18.4210526
INDONESIA	35	2.63355907	32	3	8.57142857
ISRAEL	35	2.63355907	27	8	22.8571429
KOREA	32	2.40782543	18	14	43.75
IRELAND	31	2.33258089	24	7	22.5806452
SWEDEN	30	2.25733634	26	4	13.3333333
TURKEY	30	2.25733634	29	1	3.33333333
SOUTH AFRICA	28	2.10684725	22	6	21.4285714
SINGAPORE	26	1.95635816	21	5	19.2307692
CYPRUS	19	1.42964635	12	7	36.8421053
GERMANY	19	1.42964635	8	11	57.8947368
NORWAY	19	1.42964635	15	4	21.0526316
FINLAND	17	1.27915726	12	5	29.4117647

An examination of Table 3 reveals the top 20 countries based on the number of articles authored by corresponding authors. According to the table, the United States, the United Kingdom, Australia, and China rank among the top four countries in terms of publication count. However, these countries do not rank at the top in terms of MCP (Multiple Country Publications) ratios. In other words, researchers from these countries predominantly collaborate with colleagues from within their own country.

Germany, although ranked 18th in total number of articles, stands out as the country with the highest MCP ratio among the top 20. Similarly, South Korea also has a high MCP ratio, indicating that researchers in Germany and South Korea are more open to international collaborative research. In contrast, Türkiye, Indonesia, and Canada have the lowest MCP ratios, suggesting a relatively limited level of international cooperation. Figure 8 illustrates the publication output by country.

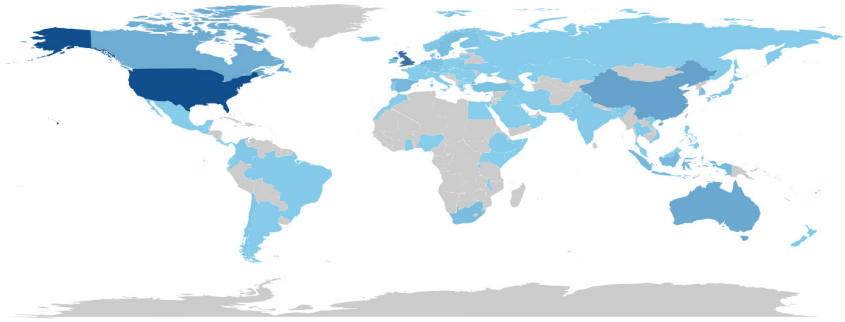


Figure 8: *Scientific Productivity of Countries*

An examination of Figure 8 shows that the gradient from dark blue to light blue on the map represents the number of publications, with the darker shades indicating higher publication counts and the lighter shades indicating fewer publications. Countries shown in grey are those for which no relevant articles were identified in the database. The quantitative data presented on the map reveal that the United States ranks first with a total of 715 publications, followed by the United Kingdom with 512 publications, China with 231 publications, and Australia with 195 publications. Figure 8 displays the countries that have received the highest number of citations.

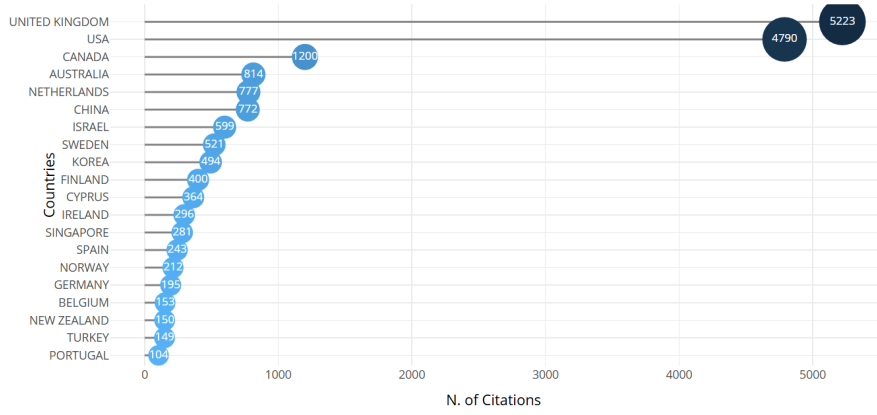


Figure 8: *Most Cited Countries*

An examination of Figure 8 shows that the countries receiving the highest number of citations on the topic are the United Kingdom (f = 5223), the United States (f = 4790), and Canada (f = 1200). Figure 9 also presents the studies that have received the greatest number of citations.

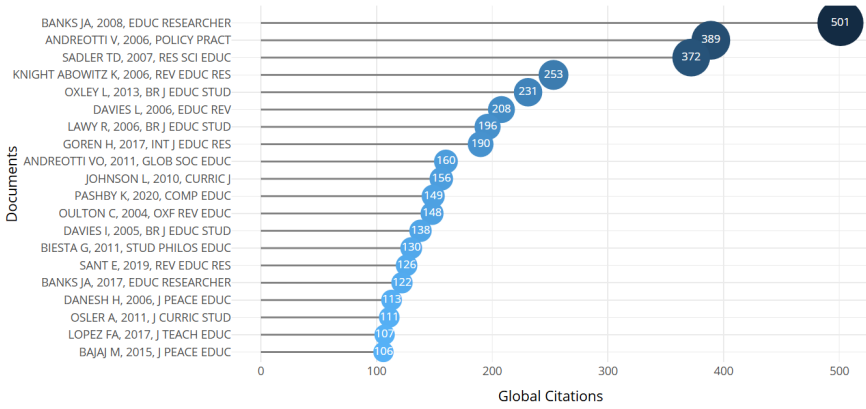


Figure 9*: Most Highly Cited Studies*

An examination of Figure 9 reveals that, on a global scale, the most highly cited articles related to the key concepts are the studies by Banks (2008) with 501 citations, Andreotti (2006) with 389 citations, and Sadler et al. (2007) with 372 citations. Figure 10 presents a visual representation of the most frequently used keywords in the articles.

Figure 10: *Word Cloud*

Word clouds, one of the methods used in text mining, display the most frequently used words within a text or paragraph. The word placed at the center represents the most frequently used term specific to the field. The size of the words and their proximity to the center indicate the extent to which these terms are used within the domain. As word size decreases and distance from the center increases, the frequency of that term diminishes accordingly. An examination of Figure 2 shows that the most frequently used keywords are *education* (f = 262), *peace education* (f = 163), *citizenship education* (f = 119), and *global citizenship education* (f = 114). Figure 11 presents a visualization showing the words most frequently used in the abstract sections of the articles.

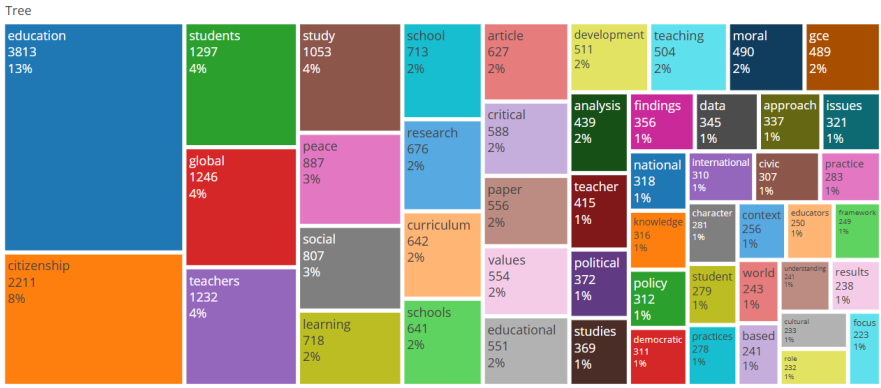
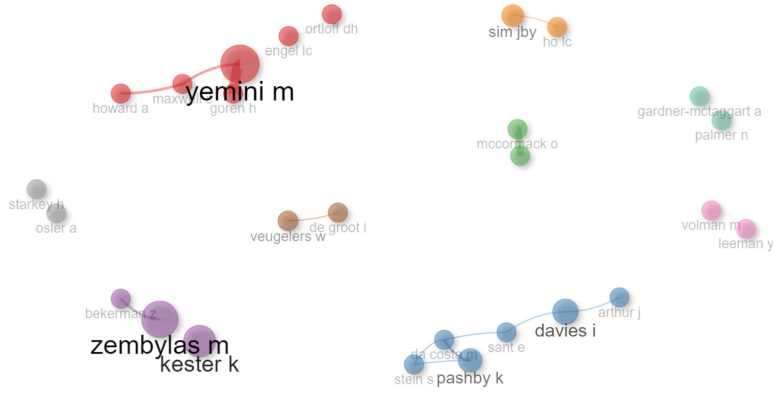


Figure 11: *Word Tree Map*

Another text-mining method is the word tree map, which visualizes the most frequently used words within a text or paragraph. The word tree map highlights terms that appear most often in the abstracts of the articles related to values education, as shown in Figure 4. According to the figure, the most frequently used words are *education* (f = 3813), *citizenship* (f = 2211), and *students* (f = 1297). Figure 12 displays the collaboration patterns among authors conducting research in this area.



According to Figure 12, authors who collaborate are grouped within the same cluster. Authors appearing in the same cluster are likely to publish on similar topics and to engage in joint research. Table 4 presents the top 20 authors in the field of values education based on their h-index rankings.

Table 4. *Authors' h-Index Rankings*

Author	h_index	TC	NP	PY_start
YEMINI M	11	532	15	2016
ZEMBYLAS M	9	349	17	2010
KESTER K	8	204	16	2013
ENGEL LC	7	169	8	2009
PASHBY K	7	334	9	2008
SIM JBY	7	140	10	2008
DAVIES I	6	283	11	2004
GOREN H	6	418	6	2016
THORNBERG R	6	258	6	2006
VEUGELERS W	6	185	9	2011
BIESTA G	5	502	5	2006
HO LC	5	97	6	2011
HOWARD A	5	69	6	2018
JEROME L	5	53	5	2005
LAW WW	5	160	5	2004
MAXWELL C	5	104	6	2018
MISCO T	5	88	7	2005
OSLER A	5	285	5	2008
SANT E	5	172	7	2016
STEIN S	5	292	5	2018

The h-index provides a means to evaluate the quality of a researcher's scientific output. According to Hirsch (2005), a researcher has an h-index of *h* if *h* of their publications have each received at least *h* citations, while the remaining publications have received no more than *h* citations. Among the 20 authors listed in the table, the earliest contributor published their first studies in 2004, whereas the most recent contributor began publishing in 2018. It is noteworthy that two of the authors ranked within the top ten—both occupying the first position—are researchers who began producing publications within the last decade.

Conclusion and Discussion

In this study, a bibliometric analysis of research conducted within the scope of values education was carried out using the Web of Science database. A total of 1,329 articles were analyzed through the R-Studio program based on searches conducted with the key concepts "values education," "character education," "moral education," "virtue education," "ethical education," "citizenship education," "values-based education," "peace education," and "civic education." The analysis examined the annual distribution of publications; the

journals and authors with the highest number of publications; the authors' h-index values related to the field; the scientific productivity of countries, collaboration networks; average citation counts, the most frequently cited studies, authors' citation burst values; and text-mining outputs such as word clouds and word tree structures.

Analysis of publication trends reveals a systematic increase in values education research starting in 2004, with significant acceleration after 2016—a shift likely influenced by evolving political and theoretical priorities. More than half of the total scholarly output was produced between 2018 and 2025, underscoring the field's growing strategic importance in both academic discourse and educational systems. Overall, findings indicate that values education has undergone a steady process of development, institutionalization, and maturation over the past two decades, resulting in a robust and expanding scientific knowledge base.

Citation analysis shows that the field gained substantial visibility between 2016 and 2021. Earlier foundational studies (particularly those published between 2004 and 2007) received higher citation counts, having established the conceptual core of the discipline. The sharp decline observed after 2022 is attributable primarily to the recency of publications and the insufficient time for citation accumulation; thus, this pattern should not be interpreted as a decline in the field's academic impact. Collectively, citation trends reflect the significant expansion and maturation of the values education literature over the last twenty years.

A three-domain analysis indicates that the intellectual structure of values education is organized around key themes such as citizenship, global citizenship, peace education, and social justice. The concentration of authors publishing on these themes in specific journals reflects both thematic and journal-based clustering within the field. Core authors have advanced the discourse by linking topics like global citizenship and peace culture to international education policy, thereby situating values education within a broader interdisciplinary framework. These results suggest that contemporary values education extends beyond moral development to encompass wider dimensions influencing social life, democratic culture, and global engagement.

An examination of publishing journals reveals that values education research clusters strongly around peace education, global citizenship, and social justice. Teacher education and curriculum studies provide the methodological and applied foundation of the field. The diversity of journals involved suggests that values education operates within a wide conceptual spectrum—spanning policy, sociology, ethics, democracy, and human rights—and evolves through interdisciplinary exchange. Consequently, the field has matured into a multidimensional academic domain addressing not only moral development but also perspectives related to social transformation and global interconnectedness.

Analysis of author productivity shows that the values education literature is shaped substantially by theoretical and globally oriented scholars such as Zembylas, Kester, and Yemini. While mid-level productive authors contribute

importantly to practical and pedagogical aspects, the broad author base sustains thematic diversity. This structure illustrates that values education is a dynamic, interdisciplinary field advancing along both political–global and pedagogical–applied trajectories.

Citation burst analysis demonstrates that particular scholars have shaped the literature continuously from 2008 to the present. The sustained influence of researchers such as Yemini and Pashby highlights the integration of global citizenship and social justice perspectives into the field. In contrast, the strong but shorter-term impact of scholars such as Goren and Da Costa represents critical contributions that redirected the literature during specific periods. These findings reinforce that values education is a continuously evolving, dynamic, and multidimensional field deeply connected to political, pedagogical, and global developments.

Analysis of author countries reveals that the United States and the United Kingdom establish the dominant theoretical, methodological, and political framework for values education. Their leadership underscores that the epistemological orientation of the field remains largely rooted in Western paradigms. Simultaneously, countries in the Asia-Pacific and Northern European regions are emerging as influential contributors. International co-authorship—a key predictor of scientific visibility and citation impact—is notably high in countries such as Germany, South Korea, and Finland. In contrast, Türkiye's limited international collaboration constrains its visibility and influence within the global literature. Overall, values education research is expanding globally as a multinational and interdisciplinary field; however, publication output remains heavily concentrated in the United States, the United Kingdom, Australia, and China, highlighting a persistent geographical imbalance. While European nations contribute robust theoretical perspectives, the Asia-Pacific region has exhibited rapid growth in recent years. Notably, regions such as Africa, Central Asia, and South America remain significantly underrepresented. This distribution suggests that knowledge production in values education is geographically concentrated and that the field's epistemological diversity remains constrained. Although Türkiye demonstrates strong policy-level engagement with values education, its global academic output remains modest. Nevertheless, growing scholarly attention in recent years may enhance Türkiye’s future standing in the field.

Citation analysis identifies the United Kingdom and the United States as the central hubs of influence in values education. These two countries shape both the theoretical and methodological foundations of the discipline, while Canada, Australia, the Netherlands, and China contribute substantially to its specialized subthemes. Among rising contributors, Israel, South Korea, and Finland are particularly prominent. Despite Türkiye’s increasing publication volume, its citation performance remains moderate—a pattern likely attributable to limited international co-authorship and a strong focus on locally contextualized studies. Collectively, these findings indicate that while intellectual influence remains concentrated in specific geographic centers, the field's visibility is gradually extending toward the Asia-Pacific and Northern Europe.

Examination of the most-cited publications shows that highly influential works by Banks (2008), Andreotti (2006), and Sadler et al. (2007) form the conceptual core of values education research. These studies establish that themes such as global citizenship, social justice, moral reasoning, and democratic participation constitute the field's intellectual center. Overall, the foundation of values education is built upon strong theoretical models, critical perspectives, and sociopolitical discourse. This evolution reflects a shift from a primarily behavior-oriented domain toward one increasingly defined by themes of social transformation, global identity, and ethical responsibility.

Keyword analysis further demonstrates that the values education literature is both expanding and undergoing thematic transformation. The frequent co-occurrence of terms such as *education*, *citizenship*, *peace education*, and *global citizenship* situates the field within a sociopolitical framework. The enduring presence of classic themes like *moral education* and *character education* reflects a stable theoretical foundation, while the prominence of *teacher education*, *curriculum*, and *pedagogy* signals a growing applied dimension. In summary, keyword patterns illustrate that values education has evolved into a dynamic field encompassing not only individual moral development but also multidimensional themes related to global engagement, social peace, justice, and democratic participation.

Treemap analysis clearly delineates the core thematic concentrations within the values education literature. The most prominent segments—education, citizenship, peace education, and global citizenship—reflect the field's strong sociopolitical and global orientation. The visibility of terms such as teachers, students, school, curriculum, and learning underscores the applied dimension of the field, which is deeply rooted in classroom practice, pedagogy, and teacher education. Furthermore, the presence of concepts like social justice, critical, policy, and democracy confirms that the literature is built upon critical-theoretical and political foundations. In sum, the treemap illustrates how values education maintains its traditional moral-development framework while evolving through contemporary lenses focused on global citizenship, peace, and social justice.

Co-authorship network analysis reveals several distinct, well-connected research communities central to the field. The largest and most densely connected cluster, centered around Yemini and Goren, represents scholarship on global citizenship and international education policy. The Zembylas–Kester cluster forms the core of critical pedagogy and affect theory in values education, while the Davies–Pashby–Sant cluster anchors research on democratic citizenship and teacher education. Smaller, more peripheral clusters suggest region-specific or practice-oriented lines of inquiry. This network structure highlights a multidimensional intellectual landscape, enriched by both robust theoretical foundations and practice-driven research agendas.

Author impact metrics indicate that values education is shaped by a cohort of highly influential scholars with strong h-index and citation profiles. Researchers such as Yemini, Zembylas, and Kester define the field's core

theoretical and empirical contours. Scholars like Pashby, Davies, Goren, and Sim contribute substantially to subthemes such as citizenship, peace, and global education. Biesta's high citation count relative to his publication volume demonstrates that even a limited number of seminal works can exert substantial academic influence. The rapidly rising impact of early- and mid-career researchers who entered the literature after 2016 further underscores the field's dynamic and evolving character. Overall, this analysis illustrates the thematic and methodological diversity embodied by the intellectual leaders of values education research.

The comprehensive bibliometric analyses conducted in this study reveal that the values education literature is characterized by a multilayered, dynamic, and increasingly globalized structure, both thematically and geographically. Publication trends show pronounced acceleration after 2008, with the period between 2018 and 2024 representing the field's peak in scholarly output. Citation analysis confirms that the intellectual core of the literature remains centered in the United Kingdom, the United States, Canada, and Australia, while the Asia-Pacific region has emerged as a significant and growing influence. Keyword and thematic mapping further demonstrate that values education has evolved beyond traditional domains of moral and character development, now being substantially shaped by sociopolitical themes such as global citizenship, peace education, social justice, human rights, democracy, and policy. Co-authorship networks reveal strong, well-organized research communities—notably led by scholars such as Yemini, Zembylas, Davies, Pashby, and Kester—who play pivotal roles in defining the field's theoretical and conceptual orientations. Collectively, these findings indicate that values education research has matured considerably, achieving greater theoretical diversity and practical richness, expanding through interdisciplinary connections, and gaining visibility across diverse global contexts.

Recommendations

Based on the findings, several directions can be proposed to advance the field of values education. It is essential to strengthen international and interdisciplinary collaboration to enhance methodological diversity and global relevance, while also deepening inquiry into emerging thematic areas such as global citizenship, peace education, and social justice through more comprehensive and comparative studies. Furthermore, increasing focus on applied dimensions—including teacher education, curriculum design, and school-based practices—will help bridge the gap between theory and implementation. Expanding research in underrepresented regions and cultural contexts is also needed to broaden the field's geographical and epistemological scope. Additionally, enhancing policy-oriented analyses will improve our understanding of how values education is shaped by and responds to educational governance at local, national, and international levels. Finally, conducting periodic bibliometric monitoring will support ongoing efforts to track the evolution of the field, identify emerging trends, and sustain its holistic growth.

REFERENCES

Aria, M. & Cuccurullo, C. (2017). Bibliometrix: An R-tool for comprehensive science mapping analysis. *Journal of Informetrics, 11*(4), 959–75.

Berkowitz, M. W. (2011). What works in values education. *International journal of educational research*, *50*(3), 153-158.

Demircioğlu, İ. H., & Tokdemir, M. A. (2008). Değerlerin Oluşturulma Sürecinde Tarih Eğitimi: Amaç, İşlev ve İçerik. Değerler Eğitimi Dergisi, 6(15), 69-88.

Hartman, E. (2013). No Values, No Democracy: The Essential Partisanship of a Civic Engagement Movement. *Michigan Journal of Community Service Learning*, *19*(2), 58-71.

Hirsch, J. E. (2005). An index to quantify an individual's scientific research output. *Proceedings of the National academy of Sciences*, *102*(46), 16569-16572.

Huang, Y. L., Ho, Y. S., & Chuang, K. Y. (2006). Bibliometric analysis of nursing research in Taiwan 1991-2004. *Journal of Nursing Research*, *14*(1), 75-81.

Karaca, A., & Kılcan, B. (2023). The Adventure of Artificial Intelligence Technology in Education: Comprehensive Scientific Mapping Analysis. *Participatory Educational Research, 10*(4), 144-165. https://doi.org/10.17275/per.23.64.10.4

Karasu Avcı, E.., Faiz, M., & Turan, S. (2020). Etkili vatandaşlık eğitiminde değerler eğitimi: Sosyal bilgiler öğretmenlerinin düşünceleri. *Değerler Eğitimi Dergisi*, *18*(39), 263-296.

Kurtuluş, M. A., & Bilen, K. (2021). A bıblıometrıc analysıs on nature of scıence: a revıew of the research between 1986-2019. *Scientific Educational Studies, 5*(1), 47-65

Martin Haigh (2020) Curriculum design for diversity: layering assessment and teaching for learners with different worldviews, Journal of Geography in Higher Education, 44:4, 487-511, DOI: 10.1080/03098265.2020.1803224

McCune, V. (2021). Academic identities in contemporary higher education: sustaining identities that value teaching. *Teaching in Higher Education*, *26*(1), 20–35. https://doi.org/10.1080/13562517.2019.1632826

Monsalve-Silva, S., Otalvaro-García, G., Velandia, L. S. C., & Sánchez, A. D. V. (2025). Integration of Democratic Values in Natural Sciences Education: a Review of the Literature of the Last 50 Years. F1000Research, 13, 940.

Pradana, M., Elisa, H. P., & Syarifuddin, S. (2023). Discussing ChatGPT in education: A literature review and bibliometric analysis. *Cogent Education*, *10*(2), 2243134.

Sagiv, L., & Schwartz, S. H. (2022). Personal values across cultures. *Annual review of psychology*, *73*(1), 517-546.

Schwartz, S. H. & Bilsky, W. (1990). Toward A Theory Of The Universal Content and Structure Of Values: Extensions and Cross-Cultural Replications. Journal Of Personality and Social Psychology, 58(5), 878-891

Snyder, D. W. (1997). *Cultural pluralism and civic education: Service-learning capacities in prejudice reduction and social development*. University of California, Berkeley.

Westheimer J: Teaching for democracy in an age of economic disparity. Routledge; 2019.

ABOUT THE AUTHORS

Mucahit KOSE works as a faculty member in the Department of Science Education at Alanya Alaaddin Keykubat University. He holds a PhD in Science Education from Gazi University. His main areas of interest include teacher education, TPACK (Technological Pedagogical Content Knowledge), STEM education, inquiry-based learning, and nature of science.

Reha ATAS works as a science teacher at Kepez Gaziler Middle School. Additionally, she is a PhD student in Curriculum and Instruction at Ege University. His main areas of interest include teacher education, curriculum adaptations, differentiated instruction, STEM education, argumentation, and curriculum studies.

Similarity Index

The similarity index obtained from the plagiarism software for this book chapter is 10%.

To Cite This Chapter:

Kose, M., & Atas, R. (2025). Global Research Trends in Values Education: A Bibliometric Analysis (2004–2025). In O. Cardak (Ed.), *Current Studies in Educational and Social Sciences 2025* (pp. 82-101). ISRES Publishing.

THE WINDS OF CHANGE IN SCIENCE HIGHER EDUCATION TO ENHANCE LEARNING OUTCOMES

B.H.S. Thimmappa
Alliance School of Sciences
Alliance University, Bangalore Karnataka, India-562106
E-mail: thimmappa.bhs@alliance.edu.in
ORCID: 0000-0002-0054-6973

Introductory Input

Knowledge for practice and knowledge beyond practice and interdisciplinary/transdisciplinary/multidisciplinary approach to higher education fosters balanced education through standardized streams of the higher education system. The four pillars of perfect learning according to the UNESCO Commission report involve the following;

i)learning to know (ability to concentrate, store information, think and develop knowledge, comprehension, ability to research and analyze)

ii)learning to be (personality development, emotional intelligence, critical thinking, and creative contribution)

iii)learning to do (ability to develop skills, solve problems, capacity to act, and knowledge application)

iv)learning to live together (social skills development, observing values, conflict resolution, multilingualism, cultural sensitivity, and an appreciation of the world's diversity) (Delors, et al., 1996; Gornitzka, Kogan, & Amaral, 2005).

A series of developments aim to improve learning outcomes by rethinking the operational aspects of universities or higher education institutions. An open science movement incorporating science, engineering, and technology elements in all undergraduate programs, followed by the respective subject specializations, is essential to restore balance in the academic world (Carter, 2005; Lynch, 2000; Linn, 1992). In this acquiring fundamental knowledge category, core content knowledge, cross-disciplinary knowledge, and digital/ICT literacy must be incorporated into outcome-based education. A few courses to develop specialized competency and future skills or learning practices including generative artificial intelligence must become an integral part of an academic program. A focus on future skills to act such as soft skills, critical thinking, systematic approach, scientific inquiry, problem-solving, interdisciplinary research aptitude, and higher-order thinking skills as a part of teaching reconsiderations and course redesign. Finally, humanistic values

such as life skills, ethical/emotional awareness, and behavioral aspects must also be taught as an integral part of the learning framework.

Each major subject should be connected to other sub-disciplines at multiple levels in the curriculum design to increase the scope and usefulness of content. It is necessary to have well-trained teachers and researchers to incorporate recent advancements in the discipline to reflect it in the syllabus design and to adopt flexible teaching and learning modalities. Active professionalism should be developed along with responsible personality development for society and ecological benefit. Proper scientific content development in each subject is essential to understanding the world, analyzing data, making informed decisions, drawing evidence-based conclusions, and resisting pseudoscience. Learners can look for better employment opportunities after higher scientific education, address complex global challenges, and contribute to international research efforts. Higher education is needed for an innovative, knowledge-based society and must involve scientific research that fosters creative thinking. High scientific literacy, spirit, and research capability lead to a high-quality demographic dividend that helps control the population, grow scientific institutions, increase the inflow of foreign investment, and create an equitable society. A higher education science program/course educational objectives and outcomes must be well-defined along with further teaching/ research/practice opportunities in the specific domains. This presentation is designed to help develop the skills, knowledge, and attitude of learners in higher educational institutions of science, engineering, and technology. It highlights the essential principles and concepts, issues and challenges, and reforms in the higher education sector. It begins with a background education gap analysis, proceeds to higher education perspectives in a global context, major issues and challenges, improving higher education, and finally concluding comments on higher education aspects and impacts.

Education Gap Analysis

Gap identification involves comparing present learner performance, skill levels, or educational program features against established benchmarks to identify a significant difference or deviation from the standards. Data collection methods involve stakeholder surveys (student, faculty, employer, alumni, parents) and the areas of focus should involve gaps in the curriculum, essential skills, support services, and technology integration while conducting a higher education gap analysis. The benefits include improved program quality, enhanced student satisfaction, strategic decision-making, and increased employability. A higher science education gap analysis indicates significant disparities between the level of scientific knowledge/skills as learning outcomes upon graduation and the actual skills/understanding they demonstrate. The learning gaps in areas like engagement with emerging topics, critical thinking, data analysis, and practical applications are significant. Lack of hands-on laboratory practice, insufficient focus on interdisciplinary connections, inadequate exposure to research methodologies, limited integration of technology in teaching-learning interactions, and a lack of orientation between curriculum and real-world scientific challenges.

A gap between theoretical knowledge and practical skills can be reduced by incorporating experiments that demonstrate the application of scientific concepts learned in the theory classes. Insufficient problem-solving skills can be solved by exposing learners to more numerical problems, project-based learning experiences, and brainstorming sessions. The students' exposure to sophisticated instruments and computational tools through demonstration or performing group experiments, exposure to inspiring breakthrough research works of Nobel Laureates in student seminars, incorporating current industry-relevant topics in the curriculum design, teacher professional development, adopting innovative teaching techniques, institute-industry collaborations, and investment in laboratory infrastructure would enhance student learning experiences. Enhancing professionalism, strengthening interdisciplinary research activities, promoting flexible higher education, internships, fellowships, policy reforms, and internationalization are crucial steps toward cultivating a culture of quality education, research, and innovation to address complex, real-world intricate challenges.

Empowering Educators

A comprehensive faculty development program must focus on the three basic aspects of teaching, research, and leadership to increase the level of technical, practical, and conceptual expertise. Faculty members should be engaged in basic and applied research and scholarly activity within their field of expertise in addition to innovative teaching-leaning interactions, and develop leadership qualities through extensive in-house training programs (Willcox, Sarma, & Lippel, 2016; Shay, 2015; Witz & Lee, 2009). Conducting guest-lecture sessions, workshops on various themes, conferences on topical topics, and particular faculty development programs will boost the awareness of advances and enhance the confidence to take innovative academic activities. Incorporating new and effective teaching strategies in value-embedded quality science/engineering/technical education would empower learners to face global challenges while considering local aspirations. Adopting high-impact teaching strategies using the conventional chalk-and-talk methods and modern PPT presentation could lead to breakthrough/disruptive innovations and sustainable progress. It is important to strengthen collaboration, network, and build professional skills that contribute to learner's success. Resource allocation, program development, faculty training, modification of curriculum, adjustment in support services, adopting high-impact teaching methods, positive student experience, increased retention rates, and generation of a better workforce as per industry demands all result in the overall improvement of higher education and better academic output. Technological integration and professional development strategies in higher educational settings help in consistent improvement in educational practice. Rewarding creativity, original thinking, and breakthrough innovation in young faculty members is essential to motivate them to become smart teachers/researchers.

Learner-centered Teaching

It is an approach where the students are at the center of the learning process, and several studies show it to be more effective than conventional teacher-centered techniques (Chiu, 2024; MacKinnon, & Bacon 2015; Pears, Nylén, & Daniels, 2016). The strategies could include periodic reflection, facilitated discussions, problem-based learning, hands-on activities, and flipped classrooms. It will enhance critical thinking, communication, collaboration, independent work, and personalized learning. We need to educate the younger generation who will challenge current scientific ideas, inspire creativity and innovation, and ignite new perspectives on the future of science, engineering, and technology by superior knowledge and proficiency. We must create a conducive learning ecosystem where knowledge, creativity, and innovation thrive and professional faculty reinforces positive attributes among students. Today's learners are tomorrow's leaders and future leaders play a pivotal role in shaping global culture, economy, and technology. Therefore, higher education must be a transformative force to direct the younger generation on the right sustainable path to progress. Public investment in the higher education sector must increase and a transparent system of approvals must be in place. Employability, entrepreneurship, and social responsibility must be enhanced through multidisciplinary programs incorporating core/open electives. The credibility of examination system must be increased to reflect the high-level competency in the respective subjects. Thus, holistic higher education must involve skill development, leveraging technology, emphasis on human values, effective teacher training and professional development, strategic assessment, and evaluation system, and focus on employability and accessibility components to have an incredible impact in enhancing learning outcomes. Knowledge-sharing and mutual learning must motivate participants in co-curricular activities and stimulate a positive research culture within institutions. Conducting workshops on different themes, symposia, invited lectures, and conferences in the institutes will enhance student motivation. Access to resources, learning materials, scientific model exhibitions, hands-on training sessions, mini-projects, student seminars, and educational visits to science museums would enhance their ability to handle complex scientific inquiries and contribute to scientific advancements.

Increasing funding for innovative projects to attract better students to support continuing education, making higher education more relevant to the job market, promoting lifelong learning, academic career, and research employment, increasing public investment in research and development (R & D), integrating digital learning into higher science education, and curriculum revision incorporating multidisciplinary courses are other higher education reforms to improve the overall quality of life and employability. Encouraging entrepreneurship with vocational training, boot camps, internships, and workshops to fulfil the aspirations of students inclined towards business innovation is also essential. Investment in learning and development (L & D) and digital teaching infrastructure is necessary to promote good learning outcomes and educational innovations. Finally, artificial intelligence (AI)

can play an important role in four key educational domains such as teaching, learning, assessment, and administration with teaching competence and work efficiency, student motivation and engagement, and academic performance (Chiu, 2024).

Role of AI in Higher Education

The multifaceted role of AI in a higher education setting impacts administration, teaching, and research (Crompton & Burke, 2023; Aler, Mora-Cantallops & Nieves, 2024; Wang, Liu & Tu, 2021). Automation of administrative tasks, personalized learning experiences, and enhanced learner engagement foster improved quality of education (Ahmad, et al., 2022; Kayyali, M. 2025). AI algorithms can analyze student performance or learning style data to create tailor-made content and customized learning trajectories. AI-powered intelligent virtual tutoring systems can offer instant feedback, track progress, and provide personalized recommendations. Generative AI tools (ChatGPT) can generate practice problems (Multiple choice questions (MCQ)/Short-answer types) and simplify complex problems, fostering a more supportive and engaging learning environment. Automated grading using AI provides more time for instructors to be involved in other curricular and extracurricular activities. AI can automate administrative tasks such as scheduling, learner record management, and data analysis, reducing the overall workload. Data-driven decisions can be taken by institutions, using AI-powered data analytics tools that can provide insights into student performance, resource allocation, and learning trends (Singh & Hiran, 2022; Chang, et al., 2022; Kuka, Hörmann, & Sabitzer, 2022). AI can be used to identify weak students and provide targeted interventions (remedial classes), improving retention and graduation rates. AI can assist researchers in various hypothesis creation, data analysis, and pattern recognition, accelerating the research process (Verma & Tomar, 2020; Chiu, 2024; Munagandla, et al., 2024). It can open up new directions for research, enabling the development of new theories and techniques. The adaptive learning platforms can make education more accessible to students with disabilities, provide equal opportunities to all, and combat academic dishonesty (plagiarism), maintaining academic integrity. AI helps prepare students for the future in data science, creative problem-solving, and data literacy to understand advanced AI technologies.

Emerging and Standard Practices

The dynamic and evolving landscape of higher science education is driven by several factors like technological advancements, societal shifts, and changing student needs. It encompasses transformations in teaching techniques, curriculum development, research practices, and the role of higher education institutions in preparing the future workforce. Technological integration into learning and development is a major trend, including the use of online learning platforms (MOOCs), virtual reality, and interactive simulations. There is a move towards more interdisciplinary, transdisciplinary, and multidisciplinary approaches, incorporating science, technology, engineering, and mathematics

(STEM) and the humanities. Focus on developing practical skills in research, data analysis, and communication and increased research engagement through various in-house projects from an early stage, fosters a sense of inquiry and innovation. It is essential to direct the energy of youngsters in the direction of addressing the pressing societal challenges including public health, climate change, and sustainable development. Some federal universities concentrate on socially useful productive research activities to cater to local needs. Research incentives must be provided to drive breakthrough innovation in basic science discovery and applied research outcomes. There is growing emphasis on the accessibility of higher education in science to all students irrespective of their background. International collaborations in scientific knowledge exchange and research activities are a trend playing a crucial role in L & D and R & D.

An Exciting Educational Experience

Nurturing learners' curiosity is one of the most important ways to help them become lifelong learners and to inspire confidence to professionalism. Encouraging students with stimulating questions can help develop their intricate thoughts, new ideas, and practical ideologies. Creating an exciting scientific environment will pave the way for developing creative problem-solving skills, and higher science and technology education is an approach to maintaining society's overall well-being. Applying an appropriate positive attitude keeps professional work in a proper perspective, and it is a way to greater personal, institutional, social, political, and business success. It is crucial to develop a unique, high-impact higher education system to inspire, motivate, energize, and empower the younger generation to bring about remarkable changes in various scientific spheres to transform society. Upgrading the knowledge and skills of university teachers is required to fine-tune their teaching skills. The most enduring impact of higher education depends on how this will unlock learner's potential and raise their self-confidence to a higher level. It requires collective effort from all the stakeholders in several sectors to create new awareness worldwide that eventually leads to scientific, technological, and economic progress. A centralized system to collect and analyze information about actual research conditions in various public and private organizations and then build human scientific resources on those details is essential to make significant contributions in their specialized area of expertise. There is a need for decentralized decision-making in higher education organizations and universities without any political interference and executing certain centralized norms to reignite the fire of higher education reforms. An insider's insight is needed for effective and comprehensive higher education policymaking, and implementing the best education practices will lead to strategic local/global achievement. The real challenges ahead to shape a better future for humankind involve producing academically accomplished, professionally dedicated, emotionally balanced, morally upright, socially responsible, and ecologically sensitive individuals through transformative higher education system.

Develop a New Way of Thinking

A contemporary trend of a rise of mediocrity and complacency as a norm of living, leading to a value crisis should be addressed. A constructive and creative attitude must become the accepted standard and a way of life. Populism, mass immaturity, idiosyncrasies, or herd mentality of a generation indicates thoughtlessness. It is essential to start a special higher education reform movement to reignite exciting educational experiences. The corruption of the higher education system, imposed conformism in the name of obedience, the climate of intolerance, the threat of dictatorship, and normalized complacency are detrimental to higher education and research outcomes. Educational thought leaders must promote forward-thinking observations, courage to swim against the tides, speaking up for what is right, and convictions and commitments to quality education and standard research. Higher philosophy with deep insights provides an opportunity to explore the ways of thinking and the spirit of inquiry in science fosters a higher form of intellectual thought process. Specialized technological application in higher education and research is inevitable as we live in a world shaped by science and technology. A combination of higher-order thinking processes and high technology could lead to sustainable development initiatives and higher quality of life. A life-long learning society committed to innovation can generate, diffuse, use, and protect knowledge while creating economic wealth and social equity. A knowledge society is an integral driver of societal transformation and sustainable progress where the people are committed to innovation and have an integrated view of life as a fusion of mind, body, and intellect. Higher science education is the most powerful weapon to change the world to train people to become critical thinkers, communicators, collaborators, and creators. This will lead to solving local and global issues, understanding and communicating innovative ideas, collaborating with other institutions, and producing high-quality education and research output. Analyzing problems by linking learning across disciplines, sharing novel ideas and solutions, working together to reach a common goal, and following new specific approaches to innovation and invention are critical capabilities in this century. Quality higher education should lead to career flexibility, work independence, creative problem-solving skills, and entrepreneurial spirit.

Global Trends and Issues

The emerging global trends include the following; i) internationalization by students, staff, programs, and institutions involving greater social mobility ii) diversification by funding agencies and types of institutions, iii) marketization involving privatization and corporatisation, iv) bureaucratization including restructuring of governance and management, resulting in global resource constraints, and v) massification, a quantitative expansion, leading to overall lowering of academic standards. In the light of these developments, reshaping doctoral education to offer world-class tertiary education is necessary. Empowering youth through excellence in higher education, increase in interdisciplinary programs, applied innovations in doctoral education, undertaking more socially relevant dissertation research, well-defined prerequisites and

course topics, making the curriculum relevant to the topic of research (contextualization and enhancement), and transnational education toward a global Ph.D. Experiencing a deep structural and bonding shift in the basic premises of rational thought, emotional feelings, and concrete actions is essential in the tertiary educational transformation and every aspiring individual should be on a superfast path to success at different levels.

National and global competitions of today require disruptive innovation in higher education through future-driven development (FDD) and value-added processes (VAP) education business model. It should emphasize quality at all steps, deliver tangible working results, provide accurate and meaningful progress, quality content to students, individual assistance in skill development, true testing and assessment, and change challenge management. Long-term higher education reforms must involve campus education incorporating online and blended learning modules should create a tsunami of disruption. Higher education system with state-of-the-art facilities, eco-friendly environment, contemporary curriculum, experienced faculty, open electives, industrial/field visits, placement offers, research and innovation, project work, digitization, seminar/invited lectures, vibrant campus life, and ethical guidelines should foster higher order thinking skills (HOTS).

A step-by-step process for building universities includes creating higher education awareness among the population, knowing the drawbacks of the present system, inspiring a developmental shift in attitude, adopting a competitive edge to higher education policies, and intensifying integrated and multilevel efforts, and building a strong worldwide higher education movement. The higher education value chain should be strengthened by involving the stakeholders such as suppliers (corporations, governments, product and service providers), customers (students, alumni, community) and institutions (faculty, staff, researchers and facilities). The driving engine of world growth and a strong foundation for the future development include higher education, the healthcare system, rural development, employment promotion, and entrepreneurship drive. The higher education system attributes such as learning and scholarship up to present frontiers of knowledge, research beyond the boundaries of existing knowledge, technology at the cutting edge, disruptive innovations to address the problems and opportunities in the industry/society, entrepreneurship that generates wealth in the society, sensitivity towards society (payback to the society) and the environment rooted in universal values (most profound life principles) on a scale commensurate with the needs of the global youth population.

Concluding Comments

This chapter emphasizes the importance of learning new skills to become leaders in this transformative educational experience and play a pivotal role in shaping the global economy and technology. Recognizing the areas for personal and professional improvement and growth and the complexity of the human learning process shapes learner's perceptions, behaviors, and actions. Promoting and strengthening the higher education system is the foundation

of educational leadership and sustainable progress. To develop educational content is to erect an architecture of thinking, building a space where a certain idea, concept, or principle is possible, allowing us to explore new strategies and solutions.

Understanding the signs of higher education gaps, and gap analysis fosters learner confidence and competencies with time, practice, and patience. Appropriate curriculum design incorporating domain knowledge, requisite skills, and proper attitude (KSA) components promotes a disciplined education regime, leading learners to achieve their full potential in their respective areas through high-level contributions (Agarwal & Juyal, 2011; Marginson, 2016; Zajda & Rust, 2016; Zajda, 2020; Carter, 2005). The higher education system must be responsive to emerging global challenges and local pressing issues and serve as instruments of higher-order thinking skills. The pressing issues like gender equality, environmental consciousness and sustainability, and professional ethics must be inculcated through good academic and administration practices, proper policy frameworks, and organizational/societal commitments. Institutional values, best practices, inquiry-based learning, focus on stimulating intellectual curiosity, creativity and independent thinking, and social and environmental responsibilities must be an integral part of the learning experience in shaping young minds. Further research is required to have cutting-edge insights into higher education reforms and professional development. It is important to develop quality innovative teaching and instructional resources, practical tips, and actionable strategies to improve learner outcomes and student success. It is important to create an environment where students feel comfortable seeking knowledge and discussing various challenges and opportunities to promote cognitive development and psychological impact in their transformative learning journey.

REFERENCES

Agarwal, C., & Juyal, S. (2011). Student Centric Learning in Higher Education-A Review. *Internat. J. Innovative Res. & Development*, *3*(11), 265-268.

Ahmad, S. F., Alam, M. M., Rahmat, M. K., Mubarik, M. S., & Hyder, S. I. (2022). Academic and administrative role of artificial intelligence in education. *Sustainability*, *14*(3), 1101.

Aler Tubella, A., Mora-Cantallops, M., & Nieves, J. C. (2024). How to teach responsible AI in Higher Education: challenges and opportunities. *Ethics and Information Technology*, *26*(1), 3.

Carter, L. (2005). Globalisation and science education: Rethinking science education reforms. *Journal of Research in Science Teaching: The Official Journal of the National Association for Research in Science Teaching*, *42*(5), 561-580.

Chang, Q., Pan, X., Manikandan, N., & Ramesh, S. (2022). Artificial intelligence technologies for teaching and learning in higher education. *International Journal of Reliability, Quality and Safety Engineering*, *29*(05), 2240006.

Chiu, T. K. (2024). Future research recommendations for transforming higher education with generative AI. *Computers and Education: Artificial Intelligence*, *6*, 100197.

Crompton, H., & Burke, D. (2023). Artificial intelligence in higher education: the state of the field. *International journal of educational technology in higher education*, *20*(1), 22.

Delors, J., Amagi, I., Carneiro, R., Chung, F., Geremek, B., Gorham, W., & Suhr, M. W. (1996). Learning. *The treasure within. Paris*.

Gornitzka, A., Kogan, M., & Amaral, A. (2005). *Reform and change in higher education* (Vol. 8). Dordrecht: Springer.

Kayyali, M. (2025). AI in Higher Education: Revolutionizing Curriculum and Administration. In *AI Adoption and Diffusion in Education* (pp. 31-62). IGI Global Scientific Publishing.

Kuka, L., Hörmann, C., & Sabitzer, B. (2022). Teaching and learning with AI in higher education: A scoping review. *Learning with Technologies and Technologies in Learning: Experience, Trends and Challenges in Higher Education*, 551-571.

Linn, M. C. (1992). Science education reform: Building on the research base. *Journal of Research in Science Teaching*, *29*(8), 821-840. Linn, M. C. (1992). Science education reform: Building on the research base. *Journal of Research in Science Teaching*, *29*(8), 821-840.

Lynch, S. J. (2000). *Equity and science education reform*. Routledge.

MacKinnon, L., & Bacon, L. (2015, June). The move to student-centric learning: Progress and pitfalls. In *International Conference on e-Learning* (p. 188). Academic Conferences International Limited.

Marginson, S. (2016). The global construction of higher education reform. *The handbook of global education policy*, 291-311.

Munagandla, V. B., Dandyala, S. S. V., Vadde, B. C., & Engineer, D. (2024). AI-Driven Optimization of Research Proposal Systems in Higher Education. *Revista de Inteligencia Artificial en Medicina*, *15*(1), 650-672.

Pears, A., Nylén, A., & Daniels, M. (2016, October). A critical analysis of trends in student-centric engineering education and their implications for learning. In *2016 IEEE Frontiers in Education Conference (FIE)* (pp. 1-7). IEEE.

Shay, S. (2015). Curriculum reform in higher education: a contested space. *Teaching in Higher Education*, *20*(4), 431-441.

Singh, S. V., & Hiran, K. K. (2022). The impact of AI on teaching and learning in higher education technology. *Journal of Higher Education Theory & Practice*, *12*(13).

Verma, S., & Tomar, P. (Eds.). (2020). *Impact of AI technologies on teaching, learning, and research in higher education*. IGI Global.

Wang, Y., Liu, C., & Tu, Y. F. (2021). Factors affecting the adoption of AI-based applications in higher education. *Educational Technology & Society*, *24*(3), 116-129.

Willcox, K. E., Sarma, S., & Lippel, P. H. (2016). Online education: A catalyst for higher education reforms. *Massachusetts Institute of Technology*.

Witz, K. G., & Lee, H. (2009). Science as an ideal: Teachers' orientations to science and science education reform. *Journal of curriculum studies*, *41*(3), 409-431.

Zajda, J., & Rust, V. (2016). Research in globalisation and higher education reforms. *Globalisation and higher education reforms*, 179-187.

Zajda, J. (2020). Globalization, education and reforms. *Wiley-Blackwell's encyclopedia of sociology*.

ABOUT THE AUTHOR

Dr. B.H.S. Thimmappa

Chemistry professional with a wealth of knowledge in developing and implementing educational technology tools and their applications in the classroom. In-depth expertise in chemistry with over hundred research papers in peer-reviewed journals, six book chapters, and a rich experience of three decades plus as an educator. Adept in creative teaching strategies that fully engross students in the learning process. Profoundly invested in accomplishing term through organizational service, board contributions, and achievement-oriented approach to teaching. He provided advisory-level consultancies to chemical industries. His research interests include chemical education, innovation, thin metallic films, catalysis, organometallics, and nanocomposite materials.

Similarity Index

The similarity index obtained from the plagiarism software for this book chapter is7 %.

To Cite This Chapter:

Thimmappa B.H.S., (2025). The Winds of Change in Science Higher Education to Enhance Learning Outcomes. In O. Çardak (Ed.), *Current Studies in Educational and Social Sciences 2025* (pp. 102-113). ISRES Publishing.

SECTION 2:
SOCIAL SCIENCES

ISBN: 978-625-6959-98-9

THE USE OF FOCUS GROUPS IN SOCIAL RESEARCH: METHODOLOGICAL ISSUES

Natasha ANGELOSKA
Ss. Cyril and Methodius University in Skopje
E-mail: natasa@ fzf.ukim.edu.mk
ORCID: 0000-0002-9048-5851

Elena GALEVSKA
University of Ljubljana
E-mail: elena.galevska@ ef.uni-lj.si
ORCID: 0000-0001-8285-9406

Introduction

Modern sciences are constantly developing and looking for new ways to explore complex social reality. In this context, research methodology plays a key role, since the quality of the results and their scientific validity depend on the choice of appropriate methods and techniques. Social research relies on quantitative methods, such as surveys, tests and statistical analyses, which offer significant information, but do not always manage to present the full picture of the attitudes, perceptions and experiences of the respondents. Therefore, in recent decades, there has been an increasing recognition of the need to employ qualitative methods that enable a deeper exploration of the subjective dimensions of social phenomena. Among the most significant techniques within this approach are focus groups.

Focus groups are a research technique that is based on an organized discussion among a small group of people, led by a moderator, in order to discover their views, opinions, values, and experiences regarding a specific topic. This interactive form of discussion facilitates the collection of data of greater depth and richness compared to those derived from standardized questionnaires or individual interviews. In addition to collecting information, focus groups create an environment in which participants complement each other, debate, and discover new ideas that would not normally arise in individual conversations.

The importance of focus groups lies also in their flexibility and adaptability to various social contexts. They can be used to examine the attitudes of respondents to certain phenomena, to analyze the effectiveness of certain methods and strategies, to investigate the problems faced by practitioners, or to obtain feedback. The data collected serves not only for scientific analysis,

but also for the practical improvement of social practice and the creation of new policies.

Although focus groups are among the most popular qualitative techniques in the social sciences, their use in social research is still quite limited and not sufficiently systematized. This raises important questions: To what extent can focus groups be an effective technique for obtaining valid and relevant data in social research?

The purpose of this paper is to highlight the significance, characteristics and application of focus groups in social research, as well as to point out their advantages and limitations in comparison with other research techniques. The significance of this topic arises from the need to analyze and confirm the role of focus groups as a valid methodological instrument in the social sciences. This includes dilemmas related to the advantages and limitations of the technique, the way of organizing and moderating the groups, as well as the question of what knowledge can be obtained through them in comparison with other research methods.

1. QUANTITATIVE AND QUALITATIVE APPROACH IN SCIENTIFIC RESEARCH

Modern research relies on different research paradigms that provide a deeper understanding of complex social processes. Two fundamental approaches are most commonly distinguished in social research: the quantitative and the qualitative. The quantitative approach is based on the application of methods that enable the measurement, comparison, and statistical analysis of data. The main goal of this approach is to obtain objective, precise and generalized results that can be applied in a broader educational context.

In quantitative studies, one uses theory deductively and places it toward the beginning of the proposal for a study. "With the objective of testing or verifying a theory rather than developing it, the researcher advances a theory, collects data to test it, and reflects on its confirmation or disconfirmation by the results." (Creswell & Creswell, 2018, p. 64) The main advantage of the quantitative approach is its ability to provide data that is measurable, verifiable, and representative. It allows researchers to draw general conclusions and formulate models that apply to a large number of cases. However, its disadvantage is its limited ability to delve into the deeper meanings, motives, and individual experiences of participants in the educational process.

The qualitative approach, unlike the quantitative one, focuses on a deeper understanding of phenomena through the analysis of the experiences, perceptions and meanings brought by the participants. Its main goal is to show the complexity of the educational reality, and not just to measure its aspects. Qualitative research uses less structured data, emphasizes the central place of subjectivity in the research process and studies 'a small number of naturally occurring cases in detail' using verbal rather than statistical analysis (Hammersley, 2013, p. 12).

The advantage of the qualitative approach is its ability to reveal new perspectives and offer deeper insights that often remain inaccessible to quantitative methods. It allows flexibility in the research process and adaptation of the methodology to the specificities of the environment. However, the limitations of this approach are related to the lower possibility of generalizing the results, as well as the greater subjectivity in their interpretation (Angeloska-Galevska, 1998).

2. QUALITATIVE RESEARCH TECHNIQUES

Qualitative research is a key way to gain an in-depth understanding of social processes, as it focuses on the meanings, experiences and perspectives of participants. Unlike the quantitative approach, which strives for measurement and generalization, the qualitative method allows for the interpretation of individual and group experiences in a specific social and cultural context. Due to the complexity of education, qualitative techniques are becoming increasingly important in contemporary social sciences, as they reveal aspects that often remain hidden behind numbers and statistics.

2.1. Differences between qualitative and quantitative techniques

Research in the social sciences is based on two basic methodological approaches – quantitative and qualitative. Although both are used to study social processes, there are significant differences in their philosophical foundations, goals, techniques for collecting and analyzing data, and the nature of the results. Understanding these differences is crucial for any researcher, as the choice of methodological approach can affect the validity, relevance, and applicability of the results obtained.

The quantitative approach is based on the idea that social phenomena can be measured and expressed through numbers, which allows for their statistical processing. This method strives for objectivity and precision, and its main goal is to test certain hypotheses and discover patterns or cause-and-effect relationships between variables. The results are expressed through statistical indicators and can be generalized to a wider population. Data in this approach is most often collected through surveys, tests or experiments, and their analysis is carried out using statistical techniques.

On the other hand, the qualitative approach emphasizes the individual perspective, meanings, and experiences of participants in the educational process. Its goal is an in-depth understanding of phenomena and the context in which they occur, rather than focusing on measurement or generalization.

Within this approach, the respondent is not just a source of data, but an active participant whose personal perspectives play a key role in the interpretation. For example, while quantitative research can provide us with information such as the grade point average, qualitative research can focus on how students experience the learning process, what attitudes and emotions they have about learning, or what strategies they use to master a particular content. Data is collected through focus groups, interviews, observations, or document

analysis, and its processing is based on interpretation, categorization, and thematic analysis, with the researcher playing an active and interpretive role.

The main difference between the two approaches lies in the nature of the data and the type of conclusions we draw. The quantitative approach offers numerical indicators that help us test hypotheses and generalize results, while the qualitative approach allows us to delve into the depth of individual experiences and contexts, without trying to apply them to a broader plan. In other words, quantitative research focuses on the questions of "how much" and "to what extent", while qualitative research deals with the "how" and "why".

Although they are often seen as two opposing methodological models, in modern social sciences they are actually considered complementary. The quantitative approach offers certainty in numbers and the possibility of comparisons, while the qualitative approach brings greater sensitivity to human experiences and the social context. Therefore, a combined approach or the so-called methodological triangulation is increasingly being applied, which integrates the advantages of both methodological directions and allows for a more complete, greater scientific reliability of the results and a richer analysis of educational phenomena (Angeloska-Galevska, N., Iliev, D., 2018).

2.2. Use and advantages of qualitative techniques in social research

Qualitative techniques in social research are crucial because they enable an in-depth understanding of the phenomena being researched. Social sciences cannot always rely only on quantitative data and statistical indicators. Social processes are complex and deeply connected with human experiences, attitudes and values. Therefore, qualitative research is an indispensable tool for understanding how participants experience social practices and interactions.

Qualitative research uses less structured data, emphasizes the central place of subjectivity in the research process and studies 'a small number of naturally occurring cases in detail' using verbal rather than statistical analysis (Hammersley, 2013, p. 12). The use of qualitative techniques is usually associated with research that aims to discover and interpret the meaning of certain experiences. For instance, by conducting interviews with employees, researchers can gain insight into how they perceive workplace communication, what challenges they face in collaborating with colleagues, and what approaches they use to overcome these difficulties. Observation as a technique allows the researcher to directly monitor the group dynamics. Focus groups, on the other hand, allow for the analysis of group interaction and the way in which attitudes and opinions are formed within the collective context.

One of the greatest advantages of qualitative techniques is their flexibility and ability to adapt to the specific environment and research problem. Unlike quantitative methods, which require strictly structured instruments and pre-determined hypotheses and variables, qualitative techniques allow the phenomenon under study to be observed in its natural and authentic form, without strictly limited categories (Newman, 2009). This helps the researcher to

understand the complexity of social processes and to arrive at deeper insights that would otherwise remain hidden behind numbers and statistical indicators.

An additional advantage of the qualitative approach is that it emphasizes the role of participants as active collaborators in the research process. Rather than being viewed as "objects of measurement," they are treated as subjects with their own experiences, voices, and interpretations of reality. This approach strengthens the validity of the data, as the results emerge directly from the experiences and perceptions of those most directly involved in the educational process.

On a practical level, these techniques help to understand the broader social and cultural context in which the educational process takes place, which is especially important for multicultural societies (Cohen, L., Manion, L., & Morrison, K., 2018). Another example of their use would be pedagogy. In this field, qualitative research significantly contributes to the development of more effective educational strategies and policies. If qualitative research reveals that students feel insufficiently supported by teachers in the learning process, this knowledge can serve as a basis for creating programs for the professional development of teachers and for improving communication in education.

In short, qualitative techniques in social research allow the researcher to enter the "inner perspective" of reality, to perceive its hidden dimensions and to offer interpretations that are close to the everyday experience of the participants. Their value is not measured in numerical precision, but in the richness and depth of the insights they offer, which represent an irreplaceable contribution to the advancement of social theory and practice.

3. FOCUS GROUPS AS A RESEARCH TECHNIQUE

Over the past five decades, focus groups have become a widely used research tool in various fields of human activity. Although their role, along with participatory observation and interviewing, is considered fundamental in generating qualitative data, as a research technique, they did not gain wider application until the Second World War, when they became an equal research technique with others in the methodology of the social sciences. The diversity of research objectives, theories and procedures that characterize the social sciences shows that the focus group is applied differently in different fields, which demonstrates its flexibility and effectiveness as a research technique. Focus groups find wide application in practice, for example, to gain insight into the opinions of voters in election campaigns, for political analysis and solutions, to determine how consumers react to a new product, to discover what employees think about the atmosphere and interpersonal relations in the work team, etc. Nowadays, focus groups are recognized as a core qualitative technique across disciplines, including sociology, education, health studies, and policy research, valued for their ability to capture the complexity of social meanings through group interaction (Morgan, 1997; Krueger & Casey, 2015).

In the following text, we critically examine the key components of the implementation of focus groups as a research technique. In doing so, the paper

provides a nuanced and multifaceted insight into the theoretical foundations of the focus group in order to enable a clearer understanding of this technique.

3.1. Definition and characteristics

Focus groups, as a research technique, generally refer to a small group of participants convened for research purposes to discuss issues related to a specific topic. Conventionally, the technique is characterized by a debate that takes place in the presence of a moderator and an observer, who notes and collects verbal and nonverbal information arising from the interaction and integrates verbal information arising from the conversation.

As a scientific research technique, focus groups are special groups of individuals selected by the researcher and brought together in one place to discuss and comment on the subject of the research through the prism of their own experience. In other words, focus groups are based on the interaction between the participants in the group regarding the topic that is the subject of the research (Barbour, R., & Kitzinger, J.,1998).

Morgan (1997) defines a focus group as a group interview focused on a specific topic, facilitated and coordinated by a moderator or facilitator, which aims to generate primarily qualitative data by taking advantage of the interaction that occurs in the group environment.

In general, a focus group refers to a small group of individuals, said to "number between six and twelve people, who meet to express their views on a specific topic defined by the researcher." (Angeloska-Galevska, 2024). In the history of behavioral research, the focus group is considered a key technique that involves exploring concepts and understanding what people say.

Although such feelings and opinions may exist independently of the group, the interaction between focus group participants can help uncover these. On the one hand, people become more aware of their own views and more willing to analyze them when confronted with the views of others; however, on the other hand, the group context can modify or suppress individuals' original views (Cohen, L., Manion, L., & Morrison, K., 2018). Nevertheless, focus groups do not elicit the opinions and feelings of individuals as are typically revealed through individual interviews – focus groups bring to the surface the differences in opinions that exist between individuals in a group context.

Hence, focus groups resemble a group interview and a group discussion. The similarity with a group interview is seen from the moderator asking more or less predefined questions to the group. Yet, differences exist, as the respondent in the interview is only answering the questions asked by the interviewer, while the respondent of a focus group has **an active** role as a participant in a discussion about the questions asked, and the answers are obtained through an exchange of opinions with other members of the group. Moreover, focus groups are not intended as forums for exchanging opinions for their own sake, nor are they designed to achieve consensus among participants. The purpose of the discussion in focus groups is to elicit responses to the research questions posed.

Focus groups differ from ordinary groups of people gathered to discuss a particular topic not only in their purpose, composition, and size, but also in the data collection procedure. Focus group research involves a series of discussions led by a specially trained moderator in an atmosphere that is perceived as safe for respondents to express their opinions and feelings.

The questions posed by the moderator are prepared in advance and carefully planned to focus the discussion on the topic, but also to stimulate the discovery of differences in the views of the respondents. Each focus group participating in the series of discussions is made up of a small number of respondents, specially selected according to some common characteristics.

3.2. History and development

Focus groups, as a research method, have an interesting history dating back to the mid-20th century and are closely associated with the social sciences, especially sociology and psychology. The earliest examples of focus group discussions appear during the Second World War, when American sociologists and psychologists, notably Robert Merton and Paul Lazarsfeld, began to apply these techniques to investigate the influence of radio and other media on public opinion (Merton, Fiske & Kendall,1956). They realized that individual interviews could not always reveal the full dynamics of attitudes and perceptions, so they developed a method in which multiple participants discuss a particular topic while the researcher carefully observes their behavior and the way their opinions are formed.

This approach was originally known as "group interviews" and was used mainly to examine the effects of propaganda, as well as to understand social reactions to various media messages. After the war, focus groups began to be applied to a greater extent in the field of market research. Companies recognized them as a useful technique for studying consumer habits and preferences, since group discussion allows for insight not only into individual attitudes, but also into the process of their formation under the influence of social interaction.

During the 1960s and 1970s, focus groups began to develop as a distinct methodological technique and gradually entered academic research. Sociologists and educators used them to examine cultural and educational differences in different communities, while psychologists applied them to gain deeper insights into the motivations, attitudes, and emotions of individuals.

The rise of qualitative research in the social sciences in the 1980s and 1990s led to a new wave of interest in focus groups. They were used as a method that not only allowed for data collection, but also helped to understand the complex processes of communication, interpretation, and negotiation of meaning within group interaction. Researchers increasingly appreciated their advantage, since they can reflect the real social conditions in which people naturally form their views and opinions.

In the modern period, focus groups have become one of the most popular qualitative techniques, applicable in a wide range of disciplines – from marketing

and political science, to education, health and public policy. In pedagogy, their role is especially important, as they allow the "voice" of students, teachers or parents to be heard in the context of educational changes. With their help, researchers can identify the needs and problems of participants in the educational process, but also understand how they collectively interpret them.

3.3. Advantages and limitations

Focus groups are considered one of the most flexible and useful qualitative techniques, and Allen Bryman (2016) points to several key advantages that make this method attractive to researchers in the social and human sciences. One of the most significant advantages is that focus groups allow for the generation of data through group interaction. Unlike individual interviews, participants not only answer the moderator's questions, but also communicate with each other, complement each other, debate and share experiences. Such interactivity allows for deeper and richer data to be obtained, which reveals the dynamics of attitudes and the process of their formation.

An additional advantage, according to Bryman, is that focus groups are particularly useful for exploring sensitive or complex topics**,** where an individual interview can create pressure on the participant. In a group context, participants feel more encouraged to share their views because they see that others have similar experiences or opinions. This is especially important in social research, where teachers, students, or parents often face similar challenges and discussing them together creates a sense of validity and acceptance.

Among other benefits, this technique stands out for its cost-effectiveness and efficiency. With relatively little time and resources, the researcher can collect information from multiple participants simultaneously. Instead of conducting dozens of individual interviews, a focus group allows for the collection of research data from multiple participants in a single, organized conversation.

However, Silverman (2021) points out that, despite their advantages, focus groups also have their limitations. One of them is the difficulty in controlling group dynamics. There is often a risk that some participants will dominate the discussion, while others remain passive. This can lead to skewed results, as the loudest opinions are more pronounced than those of quieter members.

Additionally, from a methodological perspective, focus groups are often criticized for the difficulty of analyzing the data. Discussions generate a large amount of material that includes not only verbal statements, but also nonverbal communication, mutual reactions, and emotions. All of this requires careful and complex processing, which can be more laborious compared to other methods.

According to Bryman (2016), focus groups are characterized by limited generalizability. Because they involve a small and specifically selected group of participants, the results cannot always be generalized to the wider population. Therefore, they are most often used to gain in- depth insight and generate hypotheses, rather than for statistical generalization.

Advantages of focus groups lie in their ability to provide rich, interactive and authentic insight into people's views and experiences, while the limitations are related to group dynamics, data analysis and generalization of results.

This balance between strengths and weaknesses confirms the need for researchers to carefully consider the appropriateness of this technique depending on the goals and context of the social research.

Another significant challenge is the issue of confidentiality and honesty. Although the group context can encourage openness, there is also a risk that some participants will refrain from expressing themselves honestly, especially if the topic is sensitive or if hierarchical relationships exist within the group (for example, employees and their superiors). The advantages and limitations of focus groups are summarized in Table 1.

Table 1. *Advantages and limitations of focus groups*

Advantages	Limitations
Generates data through group interaction, leading to deeper and richer information	Group dynamics are difficult to control; some participants may dominate the conversation
Encourages sharing of opinions on sensitive and complex topics in a supportive context	Risk of lack of honesty, especially if the topic is sensitive or there is a hierarchy among the participants
Economical and efficient technique (allows data collection from multiple participants simultaneously)	Data analysis is complex due to the large amount of material and nonverbal aspects.
Provides authentic and collectively constructed views	Limited generalizability; results apply to the group, but not to the wider population

3.4. Key elements: selection of participants, role of the moderator, structure of the discussion

Focus groups, as a research method, require careful preparation and organization. Three key elements: the selection of participants, the role of the moderator, and the structure of the discussion, are essential for the validity and success of the data obtained.

3.4.1. Selection of participants

The selection of participants is a key component for the quality of the discussion and the relevance of the results obtained from the focus groups. Participants should not be selected randomly, but carefully, according to criteria that are related to the research problem and the objectives of the study. Typically, individuals who are rich in information are selected as respondents in focus groups, that is, individuals from whom much can be learned about the issues that are the subject of the research. Therefore, the starting criterion for selecting respondents is their experience and knowledge regarding the subject of the research (Emmel, 2013).

In order to cover all perspectives related to the subject of the research, the research should include members of subgroups who have knowledge and experience on different aspects of the research questions. However, whenever the subgroups differ in some pivotal characteristic that leads to potentially opposing perspectives and experiences, a separate focus group should be formed from each subgroup, and a separate session should be conducted with it. For this reason, several focus groups participate in each research.

Selecting individuals who share some common characteristic that unites them and have the same interests and personal experience facilitates the discussion and makes the focus group more productive. There is no agreement in the qualitative research methods literature on the optimum number of focus groups or participants in groups, though the majority of methodological literature and reviews recommend six to ten participants per focus group as the ideal size for effective discussion and manageability. The maximum number of participants in a focus group is ten or twelve, which allows for a sufficient exchange of opinions. In smaller groups, for instance, those with only four participants, there is a higher risk that one or two individuals may dominate the discussion, thereby discouraging others from active participation. On the other hand, large focus groups become increasingly difficult to manage. When a focus group includes more than twelve participants, the discussion can easily become uncontrolled and lose coherence. There is also a risk that the group will split into smaller subgroups, as participants may lose patience while waiting too long for their turn to speak (Guest, Namey, & McKenna, 2017; Nyumba et al., 2018; Hennink, Kaiser, & Weber, 2019).

Homogeneity of the group according to certain criteria (age, professional role, educational level) creates greater freedom of expression, but at the same time can lead to a limitation of the diversity of views. Therefore, balancing between homogeneity and heterogeneity of the group of participants is one of the most significant challenges in the formation of focus groups.

3.4.2. Role of the moderator

The success of focus groups largely depends on the skill of the moderator, who is responsible for asking questions and leading the discussion. When focus groups are conducted for scientific research purposes, it is recommended that the moderator be someone directly involved in the research. This person should possess a thorough understanding of the research topic and its methodological requirements, as well as strong interpersonal skills for effectively managing group dynamics.

The moderator's primary task is to facilitate the discussion in such a way that he or she will have control over the process at all times, without insisting on controlling the content. In other words, the moderator encourages and maintains interaction between the respondents, ensuring that the discussion covers all relevant issues in adequate depth, regardless of whether the answers offered are in line with his or her expectations or not. To ensure this, the moderator needs to know how to balance the demands for sensitivity and empathy, on the one hand, and objectivity and detachment, on the other (Henderson, 1995).

The moderator is expected to show complete respect for the respondents' answers, refraining from any verbal or non-verbal evaluations. In addition to underestimation and belittling, any form of approval or agreement with the answer received should also be avoided (including nodding or short comments like excellent or correct).

It is most appropriate to adopt an attitude of incomplete understanding, but not ignorance. Thus, the moderator should convey a clear image of someone who is there to learn from the participants. In doing so, it is necessary to have the self-discipline to control their personal attitudes and views and never to present them in front of the respondents, so as not to influence their opinions. At the same time, they should also know how to deal with respondents who fall into the categories of self-proclaimed "experts", dominant discussants, shy participants or talkative respondents, in a way that will allow for an equal discussion and will not disrupt the tolerant atmosphere during the focus group session.

To ensure more effective engagement of respondents in discussion, it is often necessary that the moderator be someone with whom participants can identify. In addition to appearance, attention should be given to specific characteristics of the moderator, such as gender, age, ethnicity, language, and socio-economic background.

In addition to the ability to listen attentively to respondents, the moderator must also possess a well-developed skill of asking questions. Besides the pre-formulated questions designed to maintain the focus of the discussion, the moderator often needs to pose additional, more detailed questions aimed at stimulating dialogue and interaction among participants. The timing and manner in which such questions are asked depend on the moderator's judgment and sensitivity to the fundamental requirement of conducting the conversation unobtrusively and with discretion. In this regard, particular importance is placed on probing questions, which serve to elicit further clarification and more specific information (e.g., "Could you tell us why you think so?" or "Could you give us an example?").

The moderator's primary task is to guide the discussion and sustain interaction in the most effective manner possible. During this process, the moderator may take brief notes referring only to key points, intended primarily as reminders for the continuation of the discussion. A specially appointed assistant, who is part of the research team, is responsible for taking detailed notes of the entire discussion. In addition to documenting participants' responses, the assistant also manages the technical equipment used to record the focus group session. It should be noted that audio recording is generally preferred over video recording due to the potentially inhibiting effect of the camera. Nevertheless, it is recommended that either technique be used only in combination with on-site note-taking to ensure completeness and reliability of the data (Henderson, 1995).

3.4.3. Discussion structure

Although focus groups offer some flexibility and a natural flow of conversation, there is still a basic structure that guides the interaction. A focus group discussion typically follows a semi-structured format that balances consistency across sessions with flexibility to explore emerging themes in depth. The structure is designed to guide participants through a gradual process — from general impressions to more specific reflections — while maintaining an open, interactive atmosphere.

Most authors (Krueger & Casey, 2015; Morgan, 1997) agree that a well-conducted focus group consists of three main stages: introduction and warm-up phase, main discussion phase and closing phase. The moderator welcomes participants, explains the purpose of the study, outlines confidentiality and ethical guidelines, and establishes group norms. This phase includes icebreaker questions that encourage participants to feel comfortable speaking and to begin engaging with one another. The tone is informal but focused, aiming to build trust and rapport.

This is followed by key thematic questions related to the research problem, which must be formulated clearly and openly to encourage discussion, not simple answers. The main discussion phase is the core of the focus group, where the moderator introduces key topics or questions derived from the research objectives. Discussion moves from broad, open-ended questions to more specific, probing questions, encouraging interaction among participants rather than a series of moderator–respondent exchanges. The moderator's role is to maintain balance, ensuring that all participants contribute and that dominant voices do not overshadow others.

In the final part or closing phase of the discussion, the moderator summarizes key points, invites participants to reflect or add final thoughts, and may ask a concluding question (e.g., "Is there anything important we haven't discussed?"). This stage reinforces participants' sense of contribution and provides closure. The discussion concludes with a summary of the key points and an opportunity for participants to provide any additional comments. The moderator then expresses gratitude to the group and explains how the collected data will be utilized.

The duration of a focus group typically ranges from 60 to 120 minutes, depending on the complexity of the topic and the size of the group. Regardless of the exact format, the discussion structure should promote an interactive, reflexive exchange of perspectives, where meaning emerges from dialogue among participants rather than from individual responses alone (Stewart & Shamdasani, 2015). Such a structure enables a balance between spontaneity and systematicity, which is key to obtaining both rich and relevant data.

3.5. Ethical aspects in the use of focus groups

"Ethical decisions are contextually situated – socially, politically, institutionally, culturally, personally – and each piece of research raises ethical

issues and dilemmas for the researcher." (Cohen, Manion & Morrison, 2018, p.111). When using qualitative methods, including focus groups, we should carefully consider the ethical considerations, as this technique can yield rich and in-depth information, but it also poses significant ethical challenges that must not be ignored.

One of the main ethical dilemmas, according to Bryman (2016), is the issue of confidentiality and privacy. In individual interviews, the researcher has complete control over the protection of the data. But in focus groups, this is much more difficult, because the information that participants share becomes available to other members of the group. Brayman cautions that the researcher cannot guarantee complete confidentiality, but can only ask participants to refrain from sharing the topics discussed outside the group. This is especially sensitive in an educational context, where the topics may include personal educational challenges or family issues.

Another important aspect is informed consent. Participants should be fully informed about the nature of the research, how long it will take, how the data will be used, and their right to withdraw consent at any time. In the case of focus groups, this becomes particularly important, as participants need to be informed that the discussion will take place in a group setting, meaning they will not have the same level of privacy as in an individual interview.

Bryman (2016) also draws attention to power dynamics and the possibility of dominance within the group. He believes that there is a risk of a situation in which some participants control the conversation, while others remain in the background. This can lead not only to an uneven distribution of information but also to a feeling of discomfort for those who feel they didn't have the space they needed to voice their opinions. The ethical responsibility of the moderator is to actively manage the discussion and ensure that everyone has an equal opportunity to express themselves.

Focus groups often deal with personal or sensitive topics, so there is a risk that some questions or comments may cause stress, anxiety, or discomfort among participants. Therefore, the researcher should be careful in choosing topics and questions, as well as in the way the discussion is conducted.

Ethical aspects are not just formalities, but a fundamental requirement for the credibility and integrity of research. Without respect for the principles of voluntariness, confidentiality, and participant protection, research results could be compromised from both a methodological and a moral perspective.

4. APPLICATION OF FOCUS GROUPS IN SOCIAL RESEARCH

Focus groups are an important technique in qualitative research, as they allow data collection through dynamic group discussions, rather than just individual opinions. In the context of education, this is particularly useful, since teaching, upbringing and educational policies are experienced and practised in a community. For example, participants such as students, teachers or parents in a group setting often express opinions that they would not share in an

individual interview, because the discussion process encourages associations, disagreements or new ideas.

The use of focus groups in social research opens up many opportunities to better understand social reality and to obtain authentic experiences and opinions that cannot always be expressed through quantitative methods. Focus groups create a context in which participants reflect and build on each other, which encourages the emergence of new ideas and insights that individual interviewing might not have revealed. This is especially important in social research, where group discussion can reveal collective perspectives and depths of understanding.

Another advantage of focus groups is that they allow researchers to explore not only what participants say, but also how they communicate. This can reveal a lot about their relationships, attitudes, and values in the educational context. This approach uncovers hidden attitudes, informal practices, and cultural patterns that often go unnoticed in standard research.

Moreover, focus groups are an efficient method in terms of time and resources needed to collect the data. In a single session, the opinions and experiences of multiple participants can be obtained. This method allows for the rapid collection of a rich corpus of data, which can then be analyzed and used to create recommendations.

In contemporary social research, focus groups are increasingly used in mixed-methods designs, where they complement quantitative data by providing contextual depth and explanatory insights (Creswell & Plano Clark, 2018). The use of focus groups allows for the identification of key problems, challenges and opportunities in the educational process, as well as for the discovery of teachers' and parents' views on various social practices. In this sense, they serve not only as a data collection tool but also as a means of empowering participants and fostering reflexivity within the research process.

Ultimately, the advantages and possibilities of using focus groups in social research are related to their ability to approximate the complex reality of a social process through the voices of those who most directly experience it. They offer a more authentic and multifaceted analysis, which can be of great importance for improving policy and practice.

5. Conclusion

Focus groups are a comprehensive way to collect data in social research, as they offer the opportunity to directly understand the opinions, attitudes, and experiences of participants in an interactive and stimulating environment. Focus groups create a different dynamic than individual interviews, as participants are inspired by each other, leading to a deeper and broader understanding of the phenomenon being researched. This technique allows for the collection of qualitative data that complements the quantitative approach, which allows for a multifaceted analysis of social processes.

ISBN: 978-625-6959-98-9

When using focus groups, the role of the moderator in leading the group discussion is particularly important, as is the need for careful planning of the questionnaires and structuring of the discussion in order to obtain relevant and reliable data. Limitations, such as social desirability or the dominance of some participants, should be anticipated and minimized.

In summary, focus groups have proven to be a valuable and effective technique in social research, facilitating a deeper understanding of processes, identifying participants' needs, and formulating recommendations for practical application. Their interactive and reflective nature makes this research method important in contemporary social inquiry. Numerous successful examples demonstrate how focus groups have contributed to a better understanding of social processes and to tangible improvements in policy development, practice and broader social approaches. Consequently, focus groups in social research should be regarded not merely as a data collection tool, but as a powerful instrument for promoting practical change.

REFERENCES

Agar, M., & Macdonald, J. (1995). Focus groups and ethnography. *Human Organization* , 54(1), 78-86. Braun, V., & Clarke, V. (2013). Successful qualitative research: A practical guide for beginners. London: SAGE.

Angeloska-Galevska, N., Iliev, D. (2018). *"Application of the Methodological Triangulation in the Pedagogical Research", The education at the crossroads-Conditions, challenges, solutions and perspectives.* Bitola, Conference Proceedings, Bitola: Macedonian Science Society**.** pp. 45-48.

Barbour, R., & Kitzinger, J. (Eds.) (1998). *Developing focus group research*. London: Sage.

Bryman, A. (2016). Social research methods (5th ed.). Oxford: Oxford University Press.

Cohen, L., Manion, L., & Morrison, K. (2018). Research methods in education (8th ed.). New York: Routledge.

Creswell, J. W., & Creswell, J. D. (2018). Research design: Qualitative, quantitative, and mixed methods approaches (5th ed.). Thousand Oaks, CA: SAGE.

Creswell, J. W., & Plano Clark, V. L. (2018). Designing and conducting mixed methods research (3rd ed.). SAGE Publications.

Denzin, N. K., & Lincoln, Y. S. (2018). The SAGE handbook of qualitative research (5th ed.). Thousand Oaks, CA: SAGE.

Emmel, N., (2013). Sampling and choosing cases in qualitative research: A realist approach. Sage.

Guest, G., Namey, E., & McKenna, K. (2017). How many focus groups are enough? Building an evidence base for nonprobability sample sizes. Field Methods, 29(1), 3–22. https://doi.org/10.1177/1525822X16639015

Hammersley, M. (2013). What is qualitative research? Bloomsbury Academic.

Henderson NR. (1995). A Practical Approach to Analyzing and Reporting Focus Groups Studies: Lessons from Qualitative Market Research. Qualitative Health Research. 1995;5(4):463-477. https://doi.org/10.1177/104973239500500407

Hennink, M. M., Kaiser, B. N., & Weber, M. B. (2019). What influences saturation? Estimating sample sizes in focus group research. Qualitative Health Research, 29(10), 1483–1496. https://doi.org/10.1177/1049732318821692Henderson, N. (2016). *Secrets of a Master Moderator*. VISAR corporation.

Krueger, R. A., & Casey, M. A. (2015). Focus groups: A practical guide for applied research (5th ed.). Thousand Oaks, CA: SAGE.

Nyumba, T. O., Wilson, K., Derrick, C. J., & Mukherjee, N. (2018). The use of focus group discussion methodology: Insights from two decades of application in conservation. Methods in Ecology and Evolution, 9(1), 20–32. https://doi.org/10.1111/2041-210X.12860

Merton, R. K., Fiske, M., & Kendall, P. L. (1956). The focused interview: A manual of problems and procedures. Free Press.

Morgan, D. L. (1997). Focus groups as qualitative research (2nd ed.). Thousand Oaks, CA: SAGE.

Newman, L. W. (2009). *Social Research Methods, Quantitative and Qualitative Approaches*, Skopje: Prosvetno delo.

Patton, M. Q. (2015). Qualitative research & evaluation methods: Integrating theory and practice (4th ed.). Thousand Oaks, CA: SAGE.

Silverman, D. (2021). Qualitative research (5th ed.). London: SAGE.

Stewart, D. W., & Shamdasani, P. N. (2015). Focus groups: Theory and practice (3rd ed.). SAGE Publications.

Wilkinson, S. (1998). Focus groups in health research: Exploring the meanings of health and illness. Journal of Health Psychology, 3(3), 329–348. https://doi.org/10.1177/135910539800300304

Ангелоска-Галевска, Н. (1998). Квалитативни истражувања во воспитанието и образованието. Битола: Киро Дандаро/Angeloska -Galevska, N. (1998). Qualitative Research in Upbringing and Education. Bitola: Kiro Dandaro.

ABOUT THE AUTHORS

Natasha Angeloska Galevska is a Full Professor at the Faculty of Philosophy, Ss. Cyril and Methodius University in Skopje. She is the author of several university textbooks, including Statistical Data Analysis, Qualitative Research Methods, and Academic Speaking and Writing, as well as more than fifty chapters and articles published in academic volumes and peer-reviewed journals. She has held several academic leadership positions, such as Vice-Dean and Head of Doctoral Studies in Pedagogy for two consecutive terms.

Elena Galevska is a Teaching Assistant at the Faculty of Economics, University of Ljubljana. Having completed two Bachelor's degrees and an international Master's programme, she has developed a strong foundation in research methods. Currently, she is pursuing a PhD in business logistics. In addition, she has gained professional experience in both the non-governmental, freelancing, and for-profit sectors. In addition, she has attended multiple conferences and is the author of several publications.

Similarity Index

The similarity index obtained from the plagiarism software for this book chapter 19%.

To Cite This Chapter:

Angeloska, N., & Galevska, E., (2025). The use of focus groups insocial research: Methodological issues In O. Çardak (Ed.), *Current Studies in Educational and Social Sciences 2025* (pp. 115-132). ISRES Publishing.

ISBN: 978-625-6959-98-9

MENTAL HEALTH AND MIGRATION: ADDRESSING PSYCHOSOCIAL CHALLENGES OF AFRICAN MIGRANTS IN CANADA

(Mrs) Chinelo Immaculata, UBA

Department of Health, Safety, and Environmental Education

Faculty of Education, University of Benin, Benin City, Edo State

E-mail: immachinelouba@gmail.com &

Phone: +2349065060202 &

(Mr) Mark OGHENEBRORHIE

Department of Health, Safety, and Environmental Education

Faculty of Education, University of Benin, Benin City, Edo State

E-mail: oghenebrorhiemark@gmail.com

Phone: +2347032746674

ABSTRACT

The research explores the psychosocial challenges experienced by African migrants in Canada, emphasizing the mental health implications of migration-related stressors. African migrants experience a range of issues, from cultural adjustment and language barriers to employment discrimination and healthcare access difficulties. Adapting to a new cultural environment often brings about significant stress, while the undervaluation of foreign credentials restricts economic opportunities, leading to financial insecurity. Moreover, language barriers hinder social interactions, contributing to isolation, especially among older migrants. Racial discrimination further compounds these difficulties, affecting the mental health and self-worth of migrants as they navigate systemic barriers. The article highlights common mental health conditions among African migrants, including depression, anxiety, PTSD, and acculturative stress, which are often exacerbated by social stigmatization that discourages help-seeking behavior. It also outlines generational differences in mental health experiences, where second-generation African Canadians encounter unique stressors as they balance cultural identities. To address these challenges, the article recommends culturally responsive mental health services, training in cultural competence for practitioners, anti-discrimination policies, peer support initiatives, and further research into African migrants' mental health needs. Such measures are essential for improving the integration, well-being, and productivity of African migrants in Canada, ensuring their contributions to Canadian society are supported and valued. This study aims

to inform policymakers, healthcare providers, and community organizations about the importance of inclusive and culturally sensitive mental health care for African migrants in Canada.

Keywords*:* African migrants, Mental health, Employment discrimination, Healthcare access, Acculturative stress

Introduction

Every human being is born into a group and spends a lifetime in patterned social relations. Our actions, therefore, are closely bound with what we expect from others or what others expect and demand from us. A person's mental health hinges on their ability, or lack thereof, to adapt to their surroundings and interact with those around them (Owie & Eke-Huber, 2016). Somebody with a high degree of mental health is therefore expected to be able to adjust very well to the environment, have self-respect, have good relationships with other people, and the ability to face problems and shape the environment when it is possible and necessary. Migration is a complex social phenomenon where people move across borders driven by factors like economic opportunities, safety, and family reunification. This movement fosters connections between origin and host countries, facilitating cultural exchange and economic impact on both ends (Castles, de Haas, & Miller, 2019). Migration in Africa is synonymous to the search for "greener pastures" because the income gap between developed and developing countries is a significant motivation for many to migrate. Migrants often maintain connections with their country of origin, interacting with family members and their home community. Through these connections, there can be a valuable exchange of money, knowledge, and ideas between the host and home countries. African migrants in Canada face a range of unique psychosocial challenges as they navigate their new environment. These challenges are multifaceted and impact various aspects of their lives, including adjustment stress and cultural transition, language barriers and social isolation, economic and employment challenges, Healthcare access issues, racial discrimination and stigmatization, and family separation and loss of community support.

Mental health is essential for migrant well-being due to the complex cultural, social, and economic adjustments they face in a new environment. Research over the past several years has highlighted that these challenges increase the risk of mental health disorders among migrants. African migrants in Canada face numerous psychosocial challenges, impacting their mental health and well-being. Despite Canada's reputation for inclusivity, African migrants encounter obstacles that range from systemic discrimination to economic insecurity, all of which exacerbate mental health issues. Migrants often experience culture shock, which includes feelings of disorientation and weakness due to adapting to a new social context. This can lead to increased levels of depression, anxiety, and post-traumatic stress disorder (PTSD) (Schouler-Ocak, Kastrup, Vaishnav & Javed, 2020; Zartaloudi, 2022). Successful integration into the host culture can improve mental health outcomes, while poor integration can lead to higher psychological distress and perceived stress (Miao & Xiao, 2020; Zhou, Peng,

Chu, Zhang, Shi & Ling, 2022). Lack of social support is a significant barrier to mental well-being among migrants. Social networks and support systems are crucial facilitators of mental health, helping to mitigate feelings of isolation and discrimination (Hasan, Yee, Rinaldi, Azham, Hairi & Nordin, 2021). Economic instability, including financial constraints and lack of access to healthcare, is a major stressor for migrants, contributing to higher prevalence rates of depression and anxiety (Hou, Liu, Liang, Ho, Kim, Seong, Bonanno, Hobfoll & Hall, 2019). Migrants often face economic exploitation and poor working conditions, which exacerbate mental health problems (Hasan et Al. 2021). Understanding and addressing these issues is essential, as migrants' mental health directly affects their integration, productivity, and overall well-being. This article delves into the psychosocial challenges of African migrants in Canada, the mental health impacts, and the culturally responsive support systems needed to enhance mental health outcomes.

Overview of Migration Patterns between Africa and Canada

Migration has been a constant element influencing human societies across the course of history. According to the International Organization for Migration (IOM-OIM) (2022) there are currently around 272 million international migrants worldwide, exceeding expert projections for 2050. Emigrants from developing regions to Western industrialized countries make up a large share of the recent global migration. Currently, African migrants are considered to be one of the fastest growing migrant groups in Western advanced countries. While most people still reside in the country of their birth, an increasing number are moving to other nations, particularly within their own regions. Additionally, many are migrating to more distant, high-income countries. African migration to Canada has grown significantly, shaped by evolving immigration policies and the unique socioeconomic conditions of African countries (Okene-Ihejirika, 2023). Employment opportunities is the primary driver of international migration, with migrant workers forming the majority of global migrants. Most of these workers reside in high-income nations, with many employed in the service sector. Historically, African migration to Canada was limited, but policy changes, such as the 1967 points-based immigration system, laid the foundation for skilled migration. Since then, there has been a substantial increase in African migration, particularly in the 21st century, as Canada sought to attract skilled workers from around the world (Ontario Black History Society, 2023). Nigerians are leading a wave of increase in African migrants of recent years, becoming one of Canada's top five source countries for new migrants due to its large population of educated professionals seeking stable employment and security abroad. Many of these migrants, particularly those from Nigeria and Ghana, enter through economic pathways, making significant contributions to Canada's labor market in healthcare, engineering, and technology (Statistics Canada, 2022).

Demographically, African migrants are concentrated in major cities such as Toronto, Montreal, and Vancouver. Ontario and Quebec hold the largest African populations, with Quebec particularly attracting French-speaking migrants from

nations like the Democratic Republic of Congo and Ivory Coast. Many African migrants are young and highly educated, which helps them integrate more readily into Canadian society (Canadian Encyclopedia, 2023). A considerable number of African migrants arrive as refugees, especially from East

African nations affected by conflict, such as Somalia and Sudan. Canada's commitment to refugee protection has provided sanctuary to these individuals, who predominantly settle in provinces with established support networks, such as Ontario and Alberta (Ontario Black History Society, 2023).

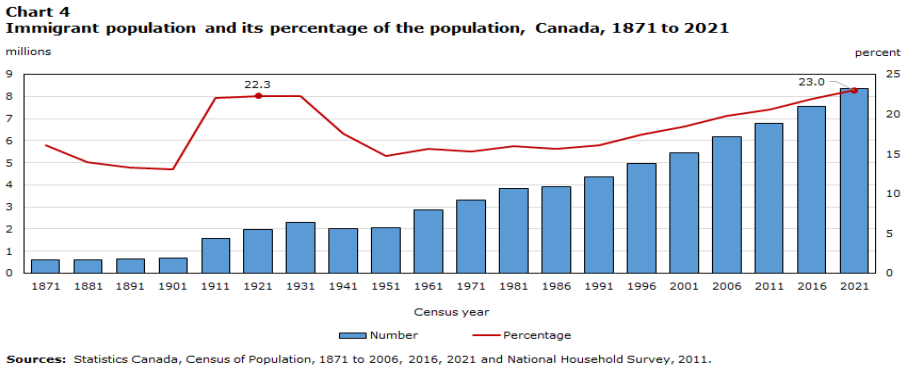


Figure 1: *Statistics Canada, Census of population, 1871 to 2006, 2016, 2021 (National Household Survey, 2011).*

African migrants are often grouped within the broader migrant or Black populations in Canada (Statistics Canada, 2019). The increase in the Black population is largely driven by a rising influx of highly educated Africans seeking improved opportunities abroad. Specifically, the proportion of Black African migrants and refugees grew from 1.9% of all newcomers before 1971 to 13% in 2016, making Africa the second-largest region sending migrants to Canada (Statistics Canada, 2017). Sub-Saharan African migrants in Canada face structural barriers, limited support systems, transnational ties, and changing gender relations, with coping mechanisms like resilience playing a crucial role in adapting to new life in Canada (Okeke-Ihejirika, Yohani, Salami, Rzeszutek, 2020).

Psychosocial Challenges Faced by African Migrants in Canada

African migrants in Canada face a number of psychosocial challenges that significantly impact their well-being and the pace of their integration into Canadian society. These challenges stem from a combination of cultural, economic, and systemic factors that affect their overall well-being and integration into Canadian society.

One prominent challenge faced by African migrants in Canada is the adjustment stress and cultural transition they have to go through in order to fully settle in their new environment. In the context of migration, individual stress (e.g., pre migration trauma), family stress (e.g., family conflict), school stress (e.g., peer bullying), and community stress (e.g., lack of belongingness) play a role in migrant adjustment experience (Juang, Simpson & Lee, 2018;

Gyan,, Chowdhury, & Yeboah, 2023). Adapting to a new environment involves numerous obstacles, such as limited healthcare access, financial instability, and a lack of sufficient resources to meet basic needs (Ellis, Abdi, & Winer, 2020). According to Woodgate and Busolo (2021), migrants noted differences which were a culture shock to them; between their cultures of origin and Canadian culture, especially in areas related to family life, parenting, and food. They observed that cultures from their homelands emphasized a sense of togetherness or "familism," whereas Canadian culture leans more toward individualism. Migrants often face difficulties in shaping their identity as they navigate between two cultural worlds. Their sense of self is influenced by their experiences before migration, their parents' cultural backgrounds, their own unique traits, and the surrounding environment. Balancing these influences can create a complex identity-building process (Woodgate & Busolo, 2021). Migrants seek ways to blend their own cultural practices with those of their new country, recognizing the importance of understanding local customs for effective integration. They share experiences of learning about Canadian culture by observing others' behaviors with patience and attentiveness. Drawing on these observations and their personal experiences, they gradually adapt to their new surroundings. In school, they learn English, connect with fellow African peers, build friendships, and gain insights into the Canadian way of life, all of which helps them navigate between different cultural identities.

African migrants in Canada face numerous economic and employment challenges that hinders their integration and success in the labor market. These challenges are diverse and often cut across various issues like gender, discrimination, and inadequate support systems. These challenges include systemic barriers to employment, where African migrants often find that their foreign qualifications and work experiences are undervalued or unrecognized. This issue often forces them to accept low-paying, entry-level jobs or positions that are below their qualifications, even when they possess advanced education and experience (Madut, 2019). Many African migrants report that their prior work experience and skills from their countries of origin are either disregarded or subjected to strict Canadian credential assessment processes, adding a costly and time-consuming hurdle to accessing professional opportunities (Madut, 2019). In a labor market influenced by gender, women encounter unique challenges in securing "survival employment" due to varying requirements for "Canadian experience," "Canadian credentials," and "Canadian accents" across different job sectors; they often struggle more than men to secure even low-wage jobs. However, in the long run, women's higher investment in additional post-secondary education in Canada gives them a slight advantage over men (Creese & Wiebe, 2012). Employment discrimination plays a significant role in economic marginalization, with many African migrants reporting unfair treatment or bias in hiring practices, especially in sectors dominated by mainstream Canadian-born workers. Participants in the study highlight that systemic racism in hiring often results in African migrants being overlooked for jobs, regardless of their qualifications. This lack of equitable employment opportunities contributes to higher rates of poverty and economic instability within African migrant communities (Madut, 2019).

African migrants often face healthcare access challenges in Canada, migrants often present with a positive health status on arrival but over time develop the same or even worse health status than Canadian-born populations as they try to adjust to the new environment, unlike refugees who often arrive in poorer general health status and often present with ill physical and mental health status due to the circumstances of their arrival. African migrants are often disappointed when they are hit with the reality that healthcare in Canada is what they expected it would be; from access to affordability. According to research by Woodgate, Busolo, Crockett, Dean, Amaladas and Plourde (2017), migrant families who had previously lived in African countries were used to a certain level of healthcare accessibility and expected to receive similar or even better services in Canada. However, many found their expectations unmet due to certain barriers within the Canadian healthcare system. For example, compared to some African healthcare systems that may offer prompt care, accessing timely healthcare services in Canada can be challenging. Migrant families visiting healthcare facilities expected basic primary care to be accessible, affordable, and appropriate. However, they faced unexpected challenges that led to disappointment and confusion. They struggled to understand the long wait times, high medication costs, and expenses associated with non-basic care services, which differed greatly from their expectations, The cost of medications and non-essential care (e.g. dental care) is very high and is not covered by the provincial health insurance coverage which migrants obtain and meeting these costs can be particularly challenging for low income migrant families, even more so if such families have children (Woodgate et al. 2017). Access to healthcare is restricted by population, community, household, and individual barriers. It was observed that migrant families adjusting to a new environment faced obstacles such as limited transportation options, harsh weather conditions, employment challenges, language and cultural differences, and a lack of social support (Levesque, Harris & Russell, 2013). Migrants are at an increased risk of developing physical and mental health issues due to their separation from familiar cultural practices, values, and social support networks, adapting to new culture and facing discrimination in a new environment. This disconnection can lead to stress and difficulty adapting, as they lack the community and social systems that once supported their well-being (Canadian Institute of Health Research, 2023).

Language barriers can significantly affect the mental health of African migrants in Canada, leading to isolation, frustration, and limited social interaction. This, in turn, impacts their overall mental well-being. Proficiency in language is essential to navigating daily life in Canada, yet for many African migrants, learning English or French can feel overwhelming. Limited language skills or lack thereof can restrict access to vital services, complicate the job search, and make effective communication within the community difficult. Consequently, many migrants rely on family or close cultural groups for support, which can provide a sense of comfort but may also contribute to their isolation from the wider society (Fong et al., 2024; McMaster Optimal Aging Portal, 2019). These language restrictions contribute to social isolation as they limit African migrants' social interactions and community involvement. Many migrants

report a sense of loneliness, when they are still trying to adjust when familiar social support systems are absent. African seniors, in particular, often feel a profound loss of social connections from their home countries, compounding feelings of isolation and mental health challenges. Studies have found that the inability to communicate fluently in Canada's official languages often prevents full integration and can even lead to intergenerational conflict within families, as younger generations adapt more quickly (GenWell Knowledge Hub, 2024; Johnson et al., 2019). Language barriers and challenges of working with interpreters impact the mental health of some migrant populations, requiring sensitivity in diagnosis and service delivery (Rousseau & Frounfelker, 2018). Similarly, Anderson, Le and Edwards (2022) found that being of African origin and lacking proficiency in Canada's national languages is associated with a higher risk of developing non-affective psychotic disorders (NAPD). These findings demonstrate how language barriers exacerbate acculturative challenges and increase vulnerability to various mental health conditions among African migrants.

Another challenge faced by African Migrants in Canada is racial discrimination and stigmatization. Throughout Canadian history, African individuals have faced racial segregation, dividing communities based on race. Africans in Canada were frequently excluded from or denied equal access to opportunities and essential services. This discrimination was especially apparent in education, healthcare, employment, housing, immigration policies, transportation, and military service. These practices entrenched inequality and perpetuated systemic barriers against Black communities (Oyeniran, 2022). African migrants often face systemic discrimination, including physical abuse and harassment, which contributes to their social and economic marginalization. These challenges hinder the ability of African Canadians to effectively integrate into Canadian society, leaving them feeling isolated and unsupported. Young migrants who may have unresolved residential issues in Canada experience sort of a "double punishment" through racialized exclusion in both education and the immigration systems. African migrant students encounter racial discrimination in educational settings, as many students report low expectations from educators despite their high performance (Villegas & Aberman, 2019). Racialized migrants in Canada with post-secondary qualifications find themselves as being the least considered for jobs for which they are qualified as the employers would rather hire Canadian-born individuals, these top credentials do not reflect in the types of jobs these individuals are able to obtain despite their over-representation in the local labour force, regulatory bodies, professional colleges, and unions constantly reject their qualifications, intensifying their employment struggles and prolonging economic distress (Madut, 2019). These African migrants that feel their skills and experiences are undervalued, become frustrated and lose confidence in themselves which impacts their psychological well-being and social connections. The high rates of unemployment and underemployment, results in cycles of poverty and these economic difficulties affects the mental health and well-being of African migrants, leading to frustration and a sense of futility in their resettlement efforts (Villegas & Aberman, 2019). While official government policy in Canada espouses equality, multiculturalism, and

ethnic diversity, this does not mean that racial discrimination has disappeared. African newcomers to the region paint a different picture in re- telling their own experiences (and those of their children) with both racism and hatred as well as a more hidden, insidious form that has come to be known as "polite racism" (Muszynski, 2014). Polite racism in Canada manifests as subtle forms of discrimination, often disguised as civility, which uphold systemic inequities against Africans and Black Canadians. Examples include exclusion in hiring, biased workplace interactions, and micro-aggressions in public spaces like stores and banks (Cotter, 2022).

Mental Health Impacts on African Migrants

The stressors of migration are often accompanied with a significant impact on the mental health of migrants with some mental health disorders more prominent than others and consequent of these stressors or exacerbated pre-existing mental health conditions or lead to the emergence of new ones. Among African migrants, common mental disorders like depression, anxiety, post-traumatic stress disorder (PTSD) and acculturative stress are among the most commonly observed mental health conditions.

Research highlights the significant impact of language proficiency on the mental health of African migrants in Canada. Jongsma et al. (2021) emphasize the complex relationship between language barriers and mental health, noting that limited ability to speak the dominant languages (English or French) upon arrival is linked to heightened risks of psychological distress, including depression and anxiety. These findings depict how language hindrances increase acculturative difficulties and increase risk to various mental health disorders among African migrants. Depression is a prevalent mental health condition affecting African migrants in Canada. Migration can create feelings of isolation and loss, intensified by experiences of discrimination, challenges in finding employment, and cultural adjustment. Studies show that the experience of migration and the process of acculturation (adjusting to a new culture) can increase vulnerability to depression in African migrants (Nielsen, Strömgren, & Lundqvist, 2019). Additionally, factors such as unemployment, financial instability, and limited social support networks contribute to the onset and worsening of depressive symptoms. Depression rates among African migrants in Canada are significantly higher compared to the general Canadian population (Rousseau, Gauthier & Vukovich, 2015). This emphasizes the challenges that African migrants face when navigating a new society that may not be entirely welcoming or accommodating to their needs. Beyond depression, many African migrants also experience anxiety, particularly in the context of acculturation stress. Migrants often face anxiety related to language barriers, employment uncertainty, and unfamiliar cultural practices. Social anxiety, related to feelings of not belonging or fear of discrimination, is also common. African migrants reported higher levels of social anxiety and general anxiety compared to the general population, largely due to experiences of racism and exclusion (Disha, Evans, & DeAngelis, 2020). Moreover, the pressure to succeed in a new country while maintaining ties to one's cultural roots, financial stress, along with fears

of deportation or legal issues can create significant internal conflict, leading to anxiety among African migrants (Almeida, McNamara & Richardson, 2020). Post-Traumatic Stress Disorder (PTSD) is experienced by migrants, particularly those who have experienced war, displacement, or violent political situations in their home countries. Many African migrants arrive in Canada after fleeing conflict zones or experiencing trauma in their country of origin. Refugees from countries like Sudan, the Democratic Republic of Congo, and Somalia are at higher risk for PTSD due to exposure to war-related violence and displacement (Simich et al., 2015). The transition to Canada can also be stressful, as refugees and migrants struggle to process their traumatic experiences while adapting to a new cultural and social environment. The lack of adequate mental health support services and the stigma surrounding mental health in some African cultures further complicates the situation, making it more difficult for affected individuals to seek help (Bourgeault & Kwan, 2019). Asides for trauma, acculturative stress which is the psychological strain of balancing two cultures is a widespread issue. Acculturation is commonly described as the process by which migrants adapt to the culture of the dominant society (Haugen & Kunst, 2019). Research in this field has predominantly centered on Latino and Asian populations, with limited attention given to African or European migrants. As a result, it remains unclear whether the relationship between acculturation, ethnic identity, and mental health in other communities reflects that observed in Latino and Asian groups. Although acculturation and mental health are related, psychological well-being is regarded as a consequence of acculturation (Sam & Berry, 2010). Acculturation has been characterized as a highly stressful experience. It is often considered a challenging process linked to issues such as psychopathology, risk-taking behaviors, and family conflicts (Smokowski, Rose, & Bacallao, 2008; Gassman-Pines & Skinner, 2018). Stress arising from acculturative responsibilities, such as language barriers, cultural differences, and discrimination, directly contributes to increased symptoms of depression, anxiety, and psychological distress among migrants. These effects are often compounded by negative emotions linked to discrimination, further intensifying mental health struggles (Manríquez-Robles, Salinas-Oñate & Smith-Castro, 2022). When acculturative stress reaches levels perceived as overwhelming or threatening to an individual's well-being, it can result in mental health issues such as depression, anxiety, or somatic symptoms (Balidemaj & Small, 2019).

Stigma surrounding mental health within African migrant communities in Canada is a significant barrier to seeking help. Many African cultures view mental illness as a result of spiritual causes, such as witchcraft, curses or moral failings, which leads to fear, shame, and reluctance to access professional mental health care (Akinyemi, Sorsdahl & Lund, 2021). Instead, individuals may turn to traditional healers or religious leaders, which delays seeking evidence-based care (Kago, Monobe & Makino, 2021). This cultural stigma, combined with additional challenges like language barriers and experiences of discrimination, deters many from accessing necessary mental health resources (Hynie, Bhardwaj & Isaji, 2021). Delays in seeking treatment can worsen mental health conditions over time, leading to more severe symptoms

and long-term consequences, such as chronic depression, anxiety, and higher risks of substance abuse or suicide (Patel et al., 2018). Untreated conditions often require more intensive care later, reducing quality of life and increasing healthcare costs (Akinyemi et al., 2021).

Acculturative tensions are particularly prominent in both first- and second-generation migrants. These challenges are linked to difficulties in adapting to the new culture and, at times, lead to feelings of alienation from their heritage community. For example, acculturation stress is often more intense among first-generation migrants, but it can also affect second-generation individuals, particularly in relation to identity confusion and external expectations (Runge & Soellner, 2023; Cho, Lee & Park, 2023). African immigrants in Canada experience significant acculturative stress, which is exacerbated by perceived discrimination and the pressure to conform to both Canadian and traditional cultural expectations (Ibekwe, 2023). Such pressures can contribute to mental health challenges like anxiety and depression.

Conclusion

This article underscores the profound mental health challenges faced by African migrants in Canada, shaped by factors such as cultural adjustment, language barriers, economic difficulties, and systemic discrimination. These stressors contribute to a higher prevalence of conditions like depression, anxiety, PTSD, and acculturative stress. The study highlights the critical role of social support, cultural identity, and systemic inclusivity in influencing the mental health outcomes of this population. By shedding light on these pressing issues, this research aims to advance understanding and foster dialogue among policymakers, healthcare providers, and community stakeholders. Ensuring the mental well-being of African migrants is not only essential for their successful integration but also for leveraging their full potential as valuable members of Canadian society.

REFERENCES

Akinyemi, O. O., Sorsdahl, K., & Lund, C. (2021). Mental health and help-seeking behavior among African immigrants in Canada. *International Journal of Social Psychiatry, 67*(4), 343–350. doi:10.1177/0020764020976921

Almeida, J., McNamara, C., & Richardson, M. (2020). The mental health of immigrants in Canada: A review of literature and policy. *Unpublished manuscript*.

Anderson, K., Le, B., & Edwards, J. (2022). Comparing risk factors for non-affective psychotic disorders with common mental disorders among migrant groups: A 25-year retrospective cohort study of 2 million migrants. *Schizophrenia Bulletin*. doi:10.1093/schbul/sbac021

Balidemaj, A., & Small, M. (2019). The effects of ethnic identity and acculturation on the mental health of immigrants: A literature review. *International Journal of Social Psychiatry, 65*(7–8), 643–655. doi:10.1177/0020764019867994

Bourgeault, I. L., & Kwan, B. (2019). Understanding the health of immigrants in Canada: Vulnerabilities and challenges. *Canadian Journal of Public Health, 110*(4), 557–564.

Canadian Immigration and Refugee Board. (2023). *Immigration trends and data in Canada – Statistics Canada.*

Canadian Institutes of Health Research (CIHR). (2023). *Strategic initiatives and funding priorities.* doi:10.1007/s10903-023-01410-x

Castles, S., de Haas, H., & Miller, M. J. (2019). *The age of migration: International population movements in the modern world.* Macmillan International Higher Education.

Cho, W., Lee, M., & Park, Y. (2023). Acculturative stress, identity confusion, and mental health challenges among immigrant youth. *Journal of Immigrant and Minority Health, 25*(3), 450–460. doi:10.1007/s10903-023-01410-x

Cotter, A. (2022). *Experiences of discrimination among the Black and Indigenous populations in Canada, 2019 (Catalogue No. 85-002-X).* Juristat. Retrieved from https://www150.statcan.gc.ca

Creese, G., & Wiebe, B. (2012). "Survival employment": Gender and deskilling among African migrants in Canada. *International Migration, 50*, 56–76. doi:10.1111/j.1468-2435.2009.00531.x

Disha, A., Evans, M. W., & DeAngelis, S. L. (2020). Acculturation, mental health, and anxiety among African migrants in Canada. *Journal of Immigrant and Minority Health, 22*(6), 1297–1304.

Ellis, B. H., Abdi, S. M., & Winer, J. P. (2020). *Mental health practice with migrant and refugee youth: A socioecological framework*. Concise Guides on Trauma Care Series. American Psychological Association. Retrieved from. https://www.apa.org/pubs/books/Ellis-Migrant-Refugee-Youth-Ch1-Sample.pdf

Fong, C., et al. (2024). Adjusting to life in Canada: Combatting isolation as a newcomer. *GenWell Knowledge Hub.* Retrieved from https://hub.genwell.ca/adjusting-to-life-in-canada-combatting-isolation-as-a-newcomer/

Gowdhury, & Yeboah, A. S. (2023). Adapting to a new home: Resettlement and mental health service experiences of migrant and refugee youth in Montreal. *Humanities and Social Sciences Communications, 10,* 86. doi:10.1057/s41599-023-01572-7

Hasan, S., Yee, A., Rinaldi, A., Azham, A., Hairi, F., & Nordin, A. (2021). Prevalence of common mental health issues among migrant workers: A systematic review and meta-analysis. *PLOS ONE, 16.* doi:10.1371/journal.pone.0260221

Haugen, I., & Kunst, J. R. (2017). A two-way process? A qualitative and quantitative investigation of majority members' acculturation. *International Journal of Intercultural Relations, 60,* 67–82. doi:10.1016/j.ijintrel.2017.07.004

Hou, W., Liu, H., Liang, L., Ho, J. H., Kim, H. C., Seong, E., Bonanno, G., Hobfoll, S. E., & Hall, B. J. (2019). Everyday life experiences and mental health among conflict-affected forced migrants: A meta-analysis. *Journal of Affective Disorders, 264,* 50–68. doi:10.1016/j.jad.2019.11.165

Hynie, M., Bhardwaj, A., & Isaji, N. (2021). Understanding the mental health challenges of African immigrants in Canada: A systematic review of the literature. *Journal of Immigrant and Minority Health, 23*(3), 541–550. doi:10.1007/s10903-020-01067-5

Ibekwe, N. (2023). *Acculturative stress and identity conflicts among African immigrants in Canada: Navigating cultural pressures and heritage preservation* (Master's thesis, Harvard University). Retrieved from\ https://dash.lib.harvard.edu/bitstream/handle/1/37373999/Nnamdi%20Ibekwe%20thesis_final.pdf

Immigration, Refugees and Citizenship Canada. (2022). *Express Entry year-end report.*

Johnson, S., Bacsu, J., McIntosh, T., Jeffery, B., & Natalia, N. (2019). Social isolation and loneliness among migrant and refugee seniors in Canada: A scoping review. *International Journal of Migration, Health and Social Care, 15*(3), 177–190. Retrieved from https://www.researchgate.net/publication/335778470

Jongsma, H. E., et al. (2021). Lost in translation: Deciphering the role of language differences in the excess risk of psychosis among migrant groups. *Psychological Medicine, 51*(15), 2565–2573. doi:10.1017/S003329172000065X

Juang, L. P., Simpson, J. A., Lee, R. M., et al. (2018). Using attachment and relational perspectives to understand adaptation and resilience among migrant and refugee youth. *American Psychologist, 73*(6), 797–811. doi:10.1037/amp0000286

Kago, M., Monobe, D., & Makino, A. (2021). Cultural influences on the mental health of African migrants: Implications for healthcare in Canada. *Psychiatry Research, 297,* 113763. doi:10.1016/j.psychres.2021.113763

Levesque, J.-F., Harris, M. F., & Russell, G. (2013). Patient-centred access to health care: Conceptualising access at the interface of health systems and populations. *International Journal for Equity in Health, 12,* 18.

Madut, K. (2019). Experiences of disadvantaged African-Canadian migrants in Ontario, Canada. *Human Geographies – Journal of Studies and Research in Human Geography.* doi:10.5719/HGEO.2019.131.4

Manríquez-Robles, D., Salinas-Oñate, N., & Smith-Castro, V. (2022). Acculturative stress, perceived social support, and mental health: The mediating effect of negative emotions associated with discrimination. *International Journal of Environmental Research and Public Health, 19*(24), 16522. doi:10.3390/ijerph192416522

McMaster Optimal Aging Portal. (2019). *Social isolation and loneliness among migrant and refugee seniors.* McMaster University. Retrieved from https://www.mcmasteroptimalaging.org

Miao, S., & Xiao, Y. (2020). Does acculturation really matter for internal migrants' health? Evidence from eight cities in China. *Social Science & Medicine, 260,* 113210. doi:10.1016/j.socscimed.2020.113210

Muszynski, A. (2014). Addressing racial and hate-based discrimination as experienced by African migrants and refugees in Waterloo Region, Canada. *Journal of Hate Studies, 12,* 39. doi:10.33972/jhs.102

Nielsen, M., Strömgren, M., & Lundqvist, L. (2019). Mental health issues in migrants: Prevalence and risk factors. *International Journal of Migration, Health, and Social Care, 15*(3), 264–275.

Okeke-Ihejirika, P. (2023). Introduction: African international migration to the West: Insights from Canada, Australia, and Nigeria. *International Migration, 61*(1). doi:10.1111/imig.13119

Okeke-Ihejirika, P., Yohani, S., Salami, B., & Rzeszutek, N. (2020). Canada's sub-Saharan African migrants: A scoping review. *International Journal of Intercultural Relations, 79,* 191–210. doi:10.1016/j.ijintrel.2020.10.001

Owie, I., & Egonwan, E.-H. (2016). *Dynamics of mental and emotional wellness* (pp. 1–2). ISBN 8747-290-49-1.

Oyeniran, C. (2022). Anti-Black racism in Canada. *The Canadian Encyclopedia.* Retrieved from https://www.thecanadianencyclopedia.ca/en/article/anti-black-racism-in-canada

Patel, V., Chisholm, D., Parikh, R., Charlson, F. J., Degenhardt, L., Dua, T., ... & Whiteford, H. (2018). Addressing the burden of mental, neurological, and substance use disorders: Key messages from Disease Control Priorities, 3rd edition. *The Lancet, 391*(10128), 1672–1685. doi:10.1016/S0140-6736(18)30491-1

Rousseau, C., & Frounfelker, R. (2018). Mental health needs and services for migrants: An overview for primary care providers. *Journal of Travel Medicine, 26.* doi:10.1093/jtm/tay150

Rousseau, C., Gauthier, L., & Vukovich, R. (2015). Depression among African immigrants in Canada: The role of cultural adaptation and acculturation. *International Journal of Social Psychiatry, 61*(8), 725–733.

Runge, C., & Soellner, R. (2023). The relationship between acculturation and mental health of 1st generation immigrant youth in a representative school survey: Does gender matter? *Child and Adolescent Psychiatry and Mental Health.* Retrieved from https://capmh.biomedcentral.com/articles/10.1186/s13034-023-00617-3

Sam, D. L., & Berry, J. W. (2010). Acculturation: When individuals and groups of different cultural backgrounds meet. *Perspectives on Psychological Science, 5,* 472–481. doi:10.1177/1745691610373075

Schouler-Ocak, M., Kastrup, M., Vaishnav, M., & Javed, A. (2020). Mental health of migrants. *Indian Journal of Psychiatry, 62,* 242–246. doi:10.4103/psychiatry.IndianJPsychiatry_358_20

Simich, L., Beiser, M., & Mawani, F. (2015). Mental health needs and treatment in immigrant and refugee populations: The impact of trauma and displacement. *International Journal of Refugee Studies,* 24(2), 183–196.

Villegas, P., & Aberman, T. (2019). A double punishment: The context of postsecondary access for racialized precarious status migrant students in Toronto, Canada. *Refuge.* doi:10.7202/1060676AR

Woodgate, R., & Busolo, D. (2021). African refugee youth's experiences of navigating different cultures in Canada: A "push and pull" experience. *International Journal of Environmental Research and Public Health, 18*(4), Article 2063. doi:10.3390/ijerph18042063

Woodgate, R., Busolo, D., Crockett, M., Dean, R., Amaladas, M., & Plourde, P. (2017). A qualitative study on African migrant and refugee families' experiences of accessing primary health care services in Manitoba, Canada: It's not easy! *International Journal for Equity in Health, 16,* Article 5. doi:10.1186/s12939-016-0510-x

Zartaloudi, A. (2022). Migrants in Greece and mental health issues. *European Psychiatry, 65*(S1), S549. doi:10.1192/j.eurpsy.2022.1406

Zhou, F., Peng, B., Chu, M., Zhang, H., Shi, L., & Ling, L. (2022). Association between migration paths and mental health of new-generation migrants in China: The mediating effect of social integration. *Frontiers in Psychiatry, 13,* Article 967291. doi:10.3389/fpsyt.2022.967291

ABOUT THE AUTHORS

Mrs. Immaculata Chinelo UBA and Mr. Mark OGHENEBRORHIE are fresh graduates and emerging scholars from the University of Benin, Benin City, Edo State, Nigeria. They both have a B.Sc. (Ed) in Health Education from the Department of Health, Safety and environmental Education. Their main area of interests are research and statistics, mental health, public health and migration. And continue to further researches around mental health and migration. They are also vast in IBM SPSS and continue to develop their career after graduation from the University of Benin.

Similarity Index

The similarity index obtained from the plagiarism software (Turnitin) for this Article is 13%.

To Cite This Article:

Uba, C.I & Oghenebrorhie, M. (2025). Mental health and migration: addressing psychosocial challenges of African migrants in Canada. In O. Cardak (Ed.), *Current Studies in Educational and Social Sciences 2025* (pp. 133-146). ISRES Publishing.

ISBN: 978-625-6959-98-9

THE ARCHITECTURAL MAGNIFICENCE AND ARTISTIC DECORATION OF THE SULTAN HASSAN MOSQUE-MADRASA IN MAMLUK CAIRO

Şeyma AKMAN
Selcuk University, Türkiye
Email:244254001002@ogr.selcuk.edu.tr
İlham ENVEROĞLU
Selcuk University, Türkiye
E-mail: ilhamenveroglu@selcuk.edu.tr

Introduction

Born in 1335, Sultan Hassan was the son of al-Nasir Muhammad. He held the throne during two separate periods (1347-1351 and 1354-1361) (İbn Tağrıberdî, 1988; Behrens-Abouseif, 2007). He was assassinated in 1361. However, Hassan's body was never found, rendering his magnificent tomb unused for its intended purpose (Gallin, 2017).

Constructed between 1356/57 and 1364, the Sultan Hassan Complex is a monumental religious foundation established beyond the city walls of Fatimid Cairo since the beginning of the Mamluk period. It occupies a site at Rumayla Square, opposite the Citadel, where palatial structures from the era of Sultan al-Nasir Muhammad once stood (Kahil, 2002). An inscription on the complex names Amir Muhammad ibn Biylik al-Muhsini as the construction supervisor (Behrens-Abouseif, 2007).

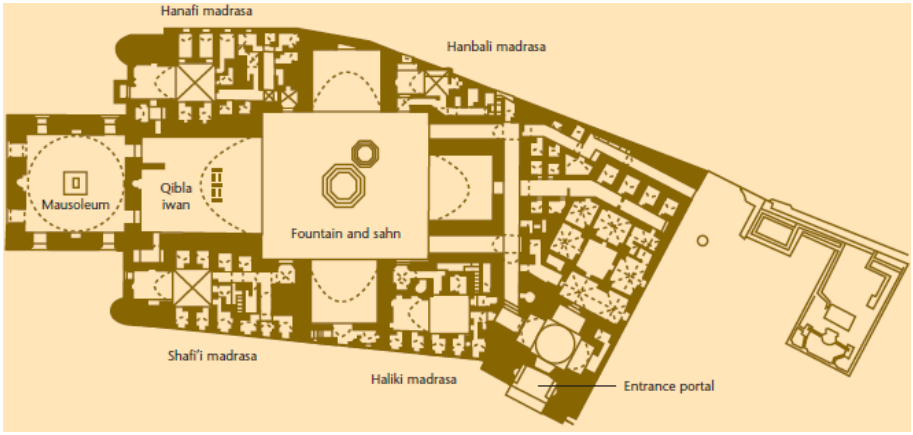


Figure 1. *Plan of the Sultan Hassan Madrasa-Mosque Complex (Yeomans, 2006)*

Architectural Description of the Sultan Hassan Complex

Regarded by historians and architects as Cairo's finest medieval Mamluk mosque, it stands as a premier monument of the Islamic world. The complex comprises a madrasa, a large mosque for Friday prayers, a hospital in the western region, and a mausoleum (Figure 2). All components are depicted in the mosque's plan (Figure 1). The mosque features four iwans, each dedicated to teaching one of the four Sunni sects (Hanafi, Shafi'i, Maliki, and Hanbali), accommodating 400 students (Gallin, 2010). A Kufic calligraphic frieze adorning the qibla iwan wall finds a parallel in the Hanafi madrasa (Figure 3).

Figure 2. *Hospital within the Sultan Hassan Complex (Khafifudin, 2025)*

The complex occupies approximately 7,906 m^2, with three façades measuring 150 m in length, 68 m in width, 38 m in entrance portal height (Figure 4). The fourth (western) façade incorporates a large commercial complex and dependencies that funded the endowment (waqf). The mausoleum's original wooden dome, sheathed in lead like that of Imam al-Shafi'i, was a notable feature (André, 1996; Hamdan, 2004; Behrens-Abouseif, 2007; Ismail, 2010). This architectural masterpiece initiated a stylistic tradition later reflected in the İsa Bey Mosque (1375, Ephesus/Selçuk) and the Sheikh Safi Shrine (1642–1667, Ardabil), and more modestly in Ottoman architecture (Aslanapa, 2014).

The mosque was inspired by Ilkhanid and Anatolian Seljuk precedents (e.g., Gök Madrasa in Sivas or Yazd Jameh Mosque) at the monumental entrance portal. However, in 1361, one minaret collapsed during construction, killing 300 students in the madrasa (Kahil, 2008; Williams, 2018). Following the disaster, the plan for four minarets was scrapped, leaving only the two existing minarets (Behrens-Abouseif, 2007).

ISBN: 978-625-6959-98-9

Figure 4. *Sultan Hassan Mosque and Complex (Tawab, 2019) and the Crown Gate (Yeomans, 2006)*

The mosque courtyard (34 m × 32 m), entirely covered by modern marble, is visually isolated from modern Cairo by towering walls. The exterior is stone-faced, while the interior features plastered brickwork with carved stone detailing (Anonymous, 2025). The central ablution fountain, originally decorative (completed 1362), stands on eight marble columns under an onion-shaped wooden canopy (Figure 5). Its Quranic-inscribed base and current form, restored during the Ottoman era, may replicate the lost original mausoleum dome (Anonymous, 2025).

As depicted in Figure 5, the courtyard floor of the Sultan Hassan Mosque features an exemplary masterpiece of Mamluk art: intricate geometric marble paving. Circles, triangles, squares, hexagons, and diamond-shaped marble pieces are harmoniously blended in diverse color combinations, meticulously fitted together in an interlocking pattern. Additionally, variations of the zencereks (chain-like ornament) are visible across the marble surface.

Figure 5. *Ablution Fountain (Yeomans, 2006) and Marble Floor in Courtyard (Gallin, 2017)*

Façade Ornamentation

Flanking the monumental portal, decorative mihrabiyes (niche patterns) feature geometric patterns. Within the mihrabiye niche, there are muqarnas kavsara decorations above geometric motifs. In Mamluk architecture, muqarnas serves both decorative and structural purposes, appearing in various forms, and is primarily used on pendentives, above entrances, and to support minaret balconies (Sadek, 2022). On the decorative columns to the right and left of the mihrabiye niche, examples of rumi and inscribed zencereek patterns are seen (Figures 6 & 7). Additionally, at the top of the portal, there are decorative Kufic, Maqili, and Thuluth calligraphy inscriptions in order.

The exterior façade portal of the complex features motifs from the hatayi and rumi groups (Figure 6 & 8). In addition to being the name of a flower, hatayi is the name of a style as well as a motif name. The other flowers included in this style are referred to as motifs in hatayi group (hatayi, penç, rosebud). Research suggests that there is a widespread belief that the hatayi motif derives its name from the lotus flower, which holds significant importance in Buddhist culture. For this reason, many sources describe the hatayi motif as the lotus motif (Çoruhlu, 1989). However, in Anatolia, this lotus motif is referred to as the hatayi motif (Figure 6). This hatayi motif was referred to in sources as huten, hata, hatay, or hıtay. The hatayi motif reached Anatolia through Central Asia to Iran by artists from Chinese-Turkistan region (Birol & Derman, 2020). Among the flowers in the hatayi group, the hatayi motif represents a stylized vertical section of a flower, the penç motif depicts a bird's-eye view of a flower, and the rosebud motif illustrates a stylized longitudinal section of a flower not fully opened in illumination style (Birol & Derman, 2020).

The rumi motif is used together in the same composition with the Penç motif on the exterior façade portal of complex (Figure 8). The term "rumi" originated from Anatolia, part of the Eastern Roman Empire, which led to the naming of the motif (Kılıç, 2021; Ünver, 1972). There are differing opinions and debates among researchers regarding whether the rumi motif has a plant

or animal origin (Aksu, 1998). Rumi motifs frequently appear in every period and on all surfaces containing decorative elements, being used in various art forms, from illumination to wood and stone carvings, from tile to hand-painting, and from metalwork to textiles. The rumi motif is often used independently but is also commonly combined with motifs such as hatayi, penç, leaves, and clouds (Türkmen, 2021). However, the term "rumi motif" was described by Europeans as "arabesque," implying an Arabic-style, intricate, and complex decorative pattern (Mülayim, 1983). As a matter of fact, the motif, with origins tracing back to the Uyghur Turks, had its earliest examples dating to the 8th century (Kılıç, 2021). The use of the rumi motif as a named motif in the field of decoration was firstly observed from the mid-16th century in book titled with “Mevaidü’n-Nefais fi Kavaidü’l-Mecalis” of Gelibolulu Mustafa Ali (Mülayim, 2015).

Figure 6. *Mihrabiye Detail and Motifs at the Façade (Ş. Akman, 2024)*

Geometric and zencerek (chain-like ornament) patterns, used by the Mamluks, enrich the façade, while traditional motifs such as hatayi, rumi, and decorative borders emphasize the complex’s Turk-origined motifs. In the portal of the crown door, alongside the double-strand border pattern formed by hatayi and rumi group motifs, the most exquisite forms of zencerek patterns are found. Rectangular and circular cartouches with rumi patterns further adorn the façade (Figure 7).

The portal’s inner wall displays knotwork patterns within a square frame , with geometric decorations and zencerek patterns in rectangular frames on both sides (Figure 8). Additionally, red and white horizontal bands cover a section of the wall ascending toward the dome. The window, made with the ajour technique, features stalactite-form decorations above it, with Quranic verses on the molding overhead. Above this inscription band, muqarnas arches in stalactite formation ascend toward the dome (Figure 9).

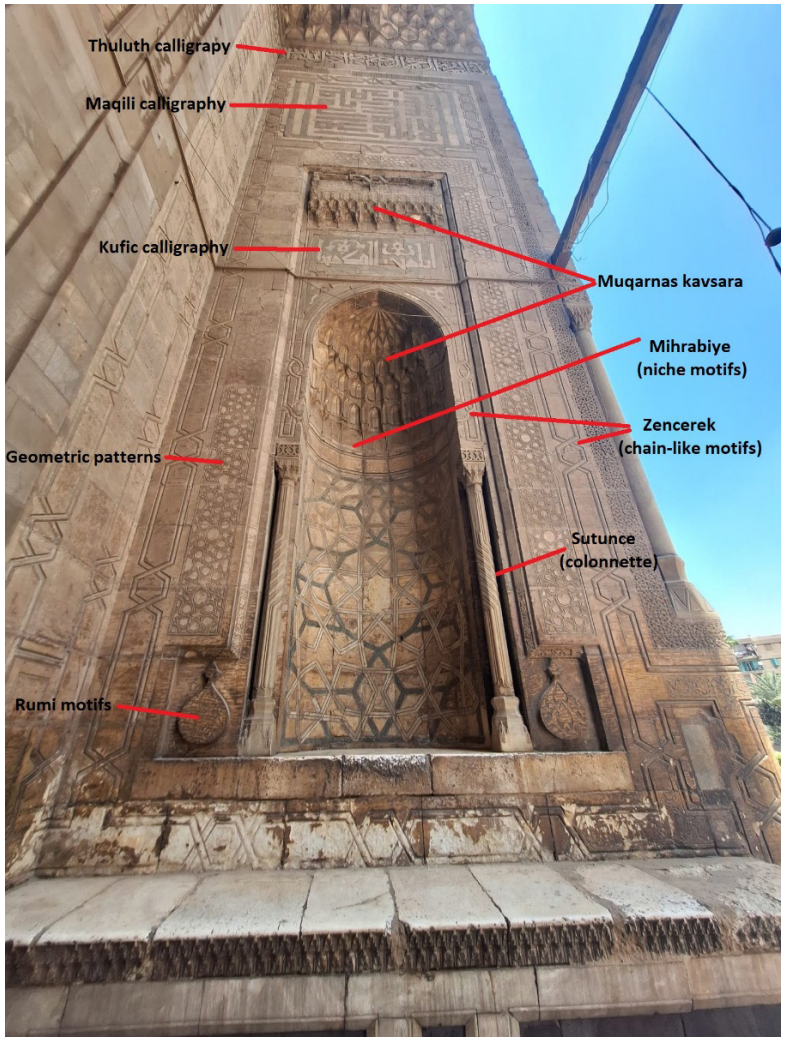
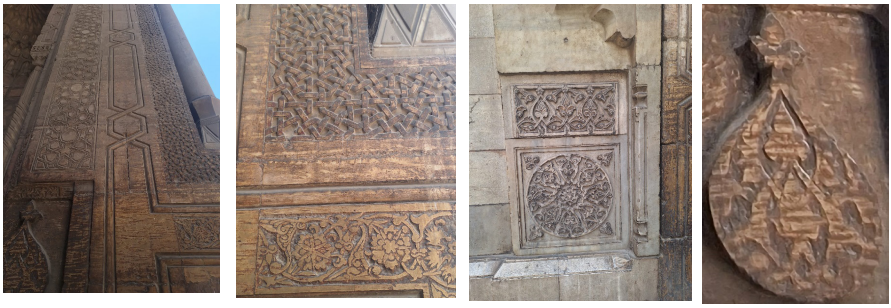


Figure 7. *Ornamentation and Calligraphy of the Façade Portal (Ş. Akman, 2024)*

ISBN: 978-625-6959-98-9



Zencerek and geometric band | *Design with penç and rumi motifs (bottom) and zencerek (top)* | *Rumi motif design* | *Rumi motif design*

Figure 8. *Detail of Exterior Decorations of the Sultan Hassan Madrasa-Mosque (Ş. Akman, 2024)*

Figure 9. *Decorations within the Entrance of the Crown Gate and Detail (Ş. Akman, 2024)*

Mihrab and Minbar

The mihrab of the Sultan Hassan Mosque is among the most magnificent examples of Mamluk architecture. Its deep recess, supported by sutunces (colonnettes), is covered in antique green, gray, white, beige, pink, and red marble arranged in geometric patterns (Figures 10 & 11). Within the mihrab niche, a composition formed by rumi patterns is painted in gold. Two different Quranic verses in gold, inscribed in Thuluth calligraphy, appear on the surface above and within the mihrab niche. A Kufic calligraphic inscription band on a stucco surface encircles the upper section of the qibla iwan wall, featuring Surah Al-Fath (Figure 11 & 12). The background field behind this inscription is adorned with decorations composed of varied forms of rumi and hatayi group patterns and zencerek patterns. Polychrome marble and gold inscriptions elevate the mihrab to the artistic pinnacle of the Egyptian Mamluk period (14th century).

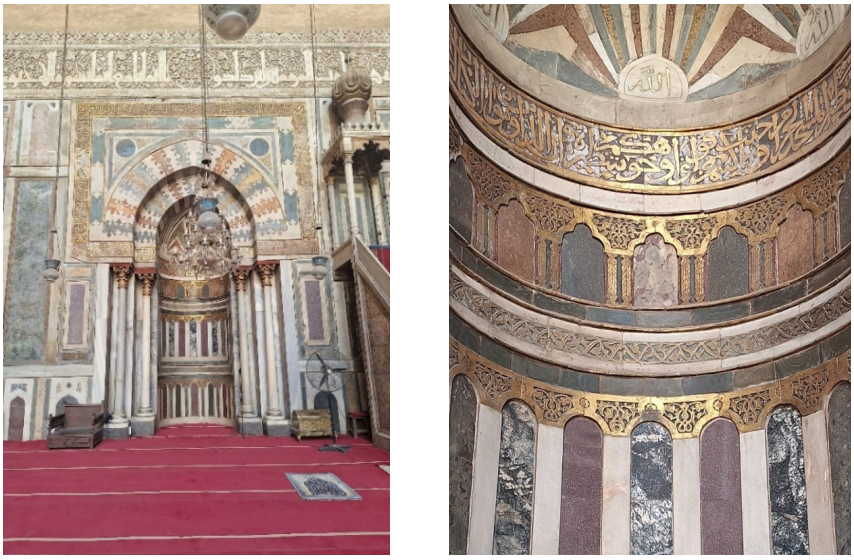


Figure 10. *Mihrab Niche and Detail (Ş. Akman, 2024)*

Figure 11. *Detail of Rumi patterns in Mihrab (Ş. Akman, 2024)*

ISBN: 978-625-6959-98-9

Figure 12. *Detail of Kufi Calligraphy (Ş. Akman, 2024)*

The minbar of the mosque features a small entrance door adorned with a composition of rumi and geometric patterns, with a gilded Quranic inscription above it (Figure 13). This elegantly decorated "الله" inscription on the double-winged door opens from the center (Figure 14 & 15).

The upper section of the wooden minbar's door lintel within the qibla iwan is framed by curved motifs in relief, creating a decorative shape for the door opening. The minbar's overall form, with its decorations, colors, and details, is immediately striking, while the door void within its frame adds distinct dimensionality (Figure 14) (Metwally, 2021). Viewed from the outside, the minbar's fluted, onion-shaped finial is a characteristic feature frequently used by the Mamluks, both in minarets and in some domes and minbar finials (Figure 15).

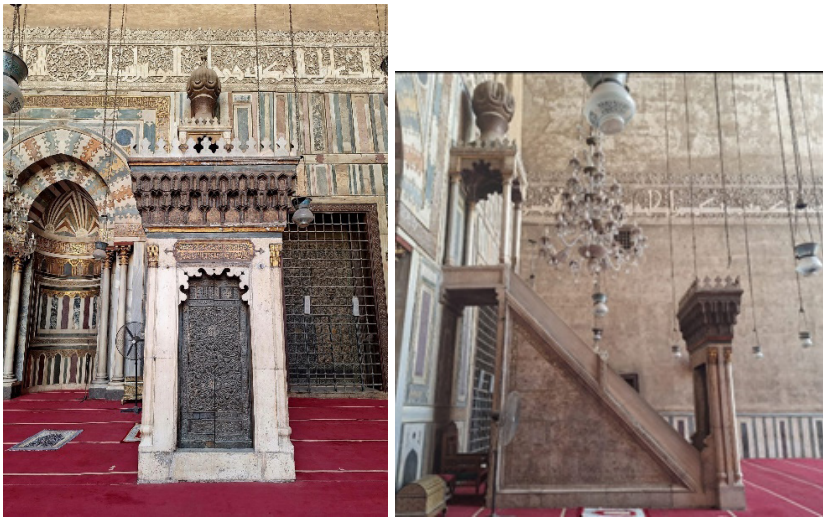


Figure 13. *Different Views of Minbar (Ş. Akman, 2024)*

Figure 14. *Detail of the Decoration above the Minbar Door (Metwally, 2021)*

Figure 15. *Finial Design and Door Detail of the Minbar (Ş. Akman, 2024)*

Mosque Chandelier

The term "chandelier," which corresponds to the Latin word candela, means "illuminating" and "shining." Chandeliers have been crafted from materials such as brass, stone, glass, porcelain, ceramic, and bronze. During the Mamluk period, chandelier-making evolved into an art form. The most magnificent Mamluk chandeliers are those made of glass (Kalfazade & Ertuğrul, 1989). The chandelier used in the Sultan Hassan Mosque serves both illuminating and decorative purposes (Figure 16). Particularly during the Mamluk period, glass chandeliers feature blazons, symbols of sovereignty, to express the power of the state (Özkan, 2014). The chandelier housed in the Calouste Gulbenkian Museum in Lisbon, Portugal, bears Sultan Hassan's blazon on its neck. Additionally, an inscription at top reading "glory to our lord the sultan" is accompanied by verses from the Qur'an (Figure 17) (Fein, 2023).

ISBN: 978-625-6959-98-9

Figure 16. *Mosque Chandelier in Qıble Iwan (Ş. Akman, 2024)*

Figure 17. *The Chandelier in the Calouste Gulbenkian Museum, Lisbon, Portugal (Fein, 2023)*

Mausoleum Chamber

In the mihrab located within the tomb chamber, decorations are comparable to those of the mihrab in the qibla iwan. Geometric mosaic panels, crafted from marble in varied shapes and colors, arranged in square and rectangular formations with horizontal and vertical patterns in addition to zigzag patterns in mihrab niche, encircle the wall of entire tomb chamber. On the inscription band within the relief decoration applied over these marble panels, Ayat al-Kursi from Surah Al-Baqarah of the Quran is inscribed. Bordering bands feature patterns composed of rumi motif forms above and below the inscription band. The muqarnas-ornamented arches encircling the dome's drum feature polychrome hand-painted rumi patterns in gradient tonalities, constituting a striking decorative ensemble (Figure 18).

Figure 18. *Detail of Mausoleum Chamber (Ş. Akman, 2024).*

In this mausoleum chamber, one of the oldest kursi (Quran holder) of its period is located. The upper side of the the kursi is designed in a V-shape where Quran is held. At the wooden kursi, zencerek (chain-like ornament) patterns are present (Figure 19). The wooden kursi features geometric interlacings, adorned with star rosettes. These rosettes are decorated with rumi pattern. Additionally, within octagonal geometric shapes, there is a spiral, triskelion-like motif consisting of three arms moving outward from the center (Figure 20).

Figure 19. *The Kursi and Zencerek Patterns in Its Different View (Gallin, 2017; Anonymous, 2012)*

Figure 20. *Detail of Kursi (Quran Holder) Decoration (Anonymous, 2012)*

ISBN: 978-625-6959-98-9

Figure 21. *Tomb in Chamber (Gallin, 2017).*

REFERENCES

Aksu, H. (1998). *Research on the Origin of Rumi*. Ph.D. diss., Mimar Sinan University, Türkiye.

André, C. L. O. T. (1996). *L'Égypte des Mamelouks : L'empire des esclaves (1250-1517)*. Éditions Perrin.

Anonymous. (2012). *The Kursi and Details in Mouseleum Chamber of Sultan Hassan Complex*. March 23, 2012 and accessed August 10, 2025, from https://civilizationlovers.wordpress.com.

Anonymous. (2025). *The Mosque-Madrasa of Al-Sultan Hassan Research*. Accessed July 1, 2025, from https://www.behance.net/gallery/44277605/The-Mosque-Madrasa-of-Al-Sultan-Hassan-Research.

Aslanapa, O. (2014). *Türk sanatı.*12. Baskı, Remzi Kitapevi.

Behrens-Abouseif, D. (2007). *Cairo of the Mamluks*. I.B. Tauris.

Birol, İ. A., & Derman, Ç. (2020). *Motifs in Turkish decorative arts* (17th ed.). Kubbealtı Academy.

Çoruhlu, Y. (1989). Uygur sanatında lotus. *Türk Dünyası Araştırmaları*, 61, 107-127.

Fein, A. (2023). A glass lamp: illuminating sultan Hassan's mosque and madrasa," in *Smarthistory*, May 4, 2023, accessed on August 14, 2025, https://smarthistory.org/a-glass-lamp-illuminating-sultan-hassans-mosque-and-madrasa/.

Gallin, P. (2017). *Mamluk art objects in their architectural context*. Master's thesis, Boston College,Boston, USA.

Hamdan, G. (2004). *The Contemporary Islamic world*. Ministry of Culture Egypt Press.

İbn Tağrıberdî. (1988). *El-Menhel es-Sâfî ve'l-Müstevâ fî Bâd el-Vâfî, Tahkîk*. N. M. Abdülazîz, Ed.; Vol. 3, Cairo.

Ismail, K. A. M. K. (2010). Sultan Hassan mosque: An Islamic architectural wonder analytical study of design and its effect on Islamic Cairo. *Journal of Islamic Architecture*, 1(2), 94-105.

Kahil, A. (2002). *The Complex of Sultan Hassan, Cairo 1357-1364*. Ph.D. diss., New York University.

Kahil, A. (2008). *The Sultan Ḥasan Complex in Cairo, 1357-1364: A case study in the formation of Mamluk styl̇e.* Peter Lang.

Kalfazade, S., & Ertuğrul, Ö. (1989). Kandil ve kandilin motif olarak Anadolu Türk sanatındaki kullanımı üzerine. *Sanat Tarihi Araştırmaları Dergisi*, 5, 23-34.

Khafifudin, M. (2025). Sejarah Masjid Sultan Hassan: Analisis dan konsep design sebagai representasi sosial budaya di Kairo. *Humanitis: Jurnal Homaniora, Sosial dan Bisnis*, 3(6), 1775–1784.

Kılıç, H. (2021). *Examination of Rumi Motifs Used in the Illuminations of XVI Century Ottoman Mushafs and Their Interpretation with Today's Understanding*. Ph.D. diss., Mimar Sinan Fine Arts University, Istanbul, Türkiye.

Metwally, E. (2021). Achieving the visual perception and gestalt psychology in Sultan Hassan mosque building. *Open Journal of Applied Sciences*, 11(1), 21–40.

Mülayim, S. (1983). *Sanat Tarihi Metodu*. İstanbul.

Mülayim, S. (2015). *Değişimin Tanıkları*. İstanbul: Kaknüs Yayınları.

O'Kane, B. (2016). *The Mosques of Egypt*. Cairo: The American University in Cairo Press.

Özkan, D. (2014). *Memlûk Dönemi Küçük El Sanatları.* Master Thesis, Ege University, İzmir, Türkiye.

Sadek, M. (2022). *Derin Tarih*. Ketebe Kitap ve Yayıncılığı, İstanbul, Türkiye.

Tawab, A. A. (2019). The potential influences of the global strategy on the conventional legislative and regulatory measures. *Landscape Architecture and Regional Planning*, 4(3), 36–52.

Türkmen, E. (2021). Unique rumi pattern discovered in süleymannemes bookbinding ornament. *Lale Journal, Culture, Art and Civilization,* 3, 26-55.

Ünver, S. (1972). Anadolu Selçuklu hanedanı tahtları üzerine. In *VII. Türk Tarih Kongresi, 1. Cilt*, Ankara, Türk Tarih Kurumu Basımevi.

Williams, C. (2018). *Islamic monuments in Cairo: The practical guide* (7th ed.). The American University in Cairo Press.

Yeomans, R. (2006). *The art and architecture of Islamic Cairo*. Garnet Publishing.

ABOUT THE AUTHORS

Şeyma AKMAN was born in the Sarayönü, Konya. In 2015, she received training in the art of marbling at the Selçuk Art Center, affiliated with Selçuk University's Faculty of Fine Arts. In 2016-2017, she had the opportunity to introduce traditional Turkish arts to international students through workshops at the Lafayette Adult Resource Academy in the United States. In 2020, she began taking charcoal drawing courses at Türe Art Gallery. She graduated from the Traditional Turkish Arts Department, specializing in Hand-Painting, Faculty of Fine Arts at Selçuk University in 2024. During this period, while completing an internship at IRFA, she was introduced to one of the oldest forms of Hand-Painting, leather-based ornamental painting, and began creating some of the first examples of this art in Konya. Currently, she is pursuing a master's degree in the Traditional Turkish Arts Department at Institute of Social Sciences of Selçuk University.

Prof. Dr. İlham ENVEROĞLU was born in 1970 in Aghjabadi, Azerbaijan, he graduated from Azim Azimzade Azerbaijan State Art School in 1989 and from the Faculty of Architecture at Azerbaijan University of Architecture and Construction in 1995. In 1998, he began working as an instructor at the Fine Arts Department of Selçuk University's Faculty of Education. He completed a master's degree in 2000 and a doctorate in 2005 in Painting Education at Selçuk University's Institute of Social Sciences, earning the title of Doctor. In 2012, he was appointed Associate Professor in the Industrial Product Design Department of Selçuk University's Faculty of Fine Arts and served as the department head from 2007 to 2020. Between 1992 and 2023, he held nearly thirty solo exhibitions in various countries and participated in around one hundred international group painting exhibitions. Since 1995, he has continued their education and artistic career in Türkiye, creating contemporary abstractions that harmonize colors, forms, and textures with mythological symbols, as if decoding the DNA of the deep-rooted culture stretching from Inner Asia to Anatolia. Drawing from the ancient and rich Turkish culture while maintaining a contemporary artistic discourse, he pursues a modern art quest inspired by classical music, folk songs, carpet and miniature art, fairy tales, and legends. The mystical philosophy of Sufism, the divine love expressed in the poetry of Mevlana, Yunus, and Fuzuli, forms the backdrop of his works, reflected through colors and patterns. He has been a member of UNESCO's International Plastic Arts Association since 2006, the Azerbaijan Artists' Union since 2010, and GESAM since 2014.

Similarity Index

The similarity index obtained from the plagiarism software for this book chapter is 0%.

To Cite This Chapter:

Akman, Ş., & Enveroğlu, İ. (2025). The Architectural Magnificence and Artistic Decoration of the Sultan Hassan Mosque-Madrasa in Mamluk Cairo. In O. Cardak (Ed.), *Current Studies in Educational and Social Sciences 2025* (pp. 147-162). ISRES Publishing.

ISBN: 978-625-6959-98-9

THE IMPACT OF SCREEN USE ON THE MENTAL HEALTH OF CHİLDREN AND ADOLESCENTS

Assistant Professor, Ph.D. Marjan NINČEVIĆ
Faculty of Croatian Studies, University of Zagreb
Department of Educational Sciences, Zagreb, Croatia
E-mail: mnincevic@fhs.hr
ORCID: 0000-0002-3027-4729

Introduction

The contemporary era is characterised by the intensive use of digital technologies, which have become an integral part of the everyday lives of children. Children are now exposed to screens more than ever before, which raises important questions about the potential impact of such exposure on their mental health. Excessive screen use can have numerous negative consequences, including attention problems, sleep disturbances, anxiety and depression.

Pedagogy, as the science of upbringing and education, has a key role in mitigating these problems through various strategies and interventions. Children use a wide range of digital devices, and the term *screen time* denotes the total time spent in front of screens. Research shows that children and adolescents aged 8 to 18 years spend, on average, more than seven and a half hours per day in front of screens, and with parallel use of multiple devices this figure rises to more than ten hours per day. Preschool children often begin using screens before the age of two and use them for more than two hours daily.

Excessive screen use negatively affects children's social interactions and emotional development, which can lead to the emergence of further mental difficulties and disorders.[1] This chapter examines these problems in more depth by analysing trends and challenges on the basis of a review of literature from various sources, including scientific articles, empirical studies, books and reports of relevant organisations. The literature used includes research conducted between 2009 and 2023. Unfortunately, in Croatia there is almost no literature or systematic research dealing with this issue. The only relevant empirical study was conducted by Roje Đapić and colleagues in 2020.

1 In 2019, Rideout and Robb investigated the impact of screen use on children aged 0–8 years and concluded that children who spend more time in front of screens have less well-developed social skills. The study, which included 1,400 parents and children, showed that children who spend more time on screens have a less developed ability to recognise and understand other people's emotional expressions.

1. The Impact of Excessive Screen Use on Children's Mental Health

1.1. Attention and Concentration Problems

The use of digital screens has become pervasive in the lives of children and adolescents. Although digital technologies can provide educational and entertaining content, excessive screen use may adversely affect mental health, including attention and concentration. Studies show that children who spend too much time in front of screens are more likely to develop attention problems, which can negatively influence their academic achievement and learning capacity.

Children exposed to rapidly changing content on screens are at increased risk of developing attention disorders, including Attention Deficit Hyperactivity Disorder (ADHD). In a study involving 2,441 children aged five to seven, it was found that those who spent more than two hours per day in front of screens had twice the risk of developing attention problems compared with children who used screens for less than one hour per day or not at all.

Research further indicates that early and frequent contact with screens can be detrimental to brain development in children. Developmental neuroscience suggests that excessive screen use may interfere with synaptic plasticity, which is crucial for learning and the development of cognitive functions. Brain regions responsible for attention and executive functions appear to be particularly affected, resulting in difficulties with sustained attention and concentration.

Several longitudinal studies have linked excessive screen use with an increased risk of developing ADHD symptoms. One study conducted on a sample of more than 2,500 children showed that those who spent more than two hours per day in front of screens had a significantly higher risk of developing ADHD symptoms than children who used screens for less than one hour per day. The study followed pupils over a three-year period and emphasised the importance of setting limits on screen time in order to reduce the risk of attention and concentration problems.

Excessive screen use is also associated with increased impulsivity and reduced ability to maintain attention. A study from 2009 found that children who spent more time watching television and playing video games were more likely to develop attention problems. The rapid pace and high level of stimulation characteristic of digital content reduce children's ability to concentrate on slower activities.

Research additionally shows that frequent use of digital devices encourages multitasking, which can lead to reduced ability to focus and increased distractibility. Children who engage in multitasking more often perform worse on tests of attention and concentration than those who rarely or never multitask. A longitudinal study from 2012 examining the effects of video games on children's attention found that children who spent more time playing video games were more likely to develop attention problems. The content of video games can have different effects on attention; violent games, in particular, seem to have more pronounced negative effects.

A 2016 study examined the relationship between smartphone use and attention in adolescents. The results showed that excessive smartphone use was significantly correlated with attention problems, including increased impulsivity and a reduced ability to sustain attention on tasks.

1.2. Sleep Disorders

Research demonstrates that screen use, especially before bedtime, can significantly affect children's sleep quality. Excessive use of screens, including televisions, computers, tablets and smartphones, raises serious concerns due to possible negative consequences for mental health, particularly with regard to sleep quality and duration.

Two authors conducted a systematic review of 67 studies on the impact of screens on sleep in children and adolescents. Their results consistently showed that screen use before bedtime negatively affects both the duration and quality of sleep. Children who use screens immediately before sleeping tend to have a later sleep onset, shorter sleep duration and poorer sleep quality.

Using technology before bedtime can cause difficulties with falling asleep and decrease overall sleep duration. The review highlighted the importance of setting limits on screen use in order to improve sleep quality among children and adolescents. Another study on a large sample of adolescents found that excessive use of social networks and video games was significantly correlated with shorter sleep duration and poorer sleep quality. Adolescents who used screens for more than four hours per day had twice the risk of sleep problems compared with those who used screens for less than one hour per day.

Research conducted with children younger than six years revealed that those who spent more time in front of screens were at higher risk of difficulties with falling asleep. This study also underlined the need to limit screen time among younger children to ensure healthy sleep development.

A 2016 study further analysed the effects of mobile device use on sleep in children and adolescents. The results showed that children who used mobile devices in their bedrooms had shorter sleep duration, more frequent nocturnal awakenings and poorer overall sleep quality compared with children who did not use devices in the bedroom.

1.3. Anxiety and Depressive Disorders

Numerous studies show an association between excessive screen use and increased levels of anxiety and depression in children and adolescents. Although technology offers many advantages, excessive screen use can have serious negative consequences for mental health. Anxiety and depression are two major problems that are increasingly prevalent among young people. Research suggests a link between excessive use of social media and heightened levels of anxiety and depression in children and adolescents.

1.3.1. Anxiety

Anxiety is a complex disorder that can significantly impair quality of life. Understanding its symptoms, causes and treatment options is crucial for effective management. Children who spend more time on social media are more likely to develop anxiety, and longer time spent on social media correlates with higher levels of anxiety in adolescents. Children who spent more than three hours per day on social networks had significantly higher levels of anxiety compared with those who used them for less than one hour per day.

One study found that children who had been victims of cyberbullying[2] exhibited markedly higher levels of anxiety than children who were not exposed to online abuse. Cyberbullying has been identified as a significant risk factor for the development of anxiety disorders. Analyses of the effects of information overload on children's mental health have shown that children who are constantly exposed to large quantities of information via digital media are also more likely to develop anxiety symptoms.

1.3.2. Depression

Depression is a serious mood disorder characterised by persistent feelings of sadness, loss of interest in previously enjoyable activities, and various emotional and physical difficulties that interfere with everyday functioning. Although depression can occur at any age, its symptoms in children often differ from those in adults.

In children, depression may manifest through a range of emotional, physical and behavioural symptoms, which can vary according to age and individual characteristics. Childhood depression often remains unrecognised because its symptoms may be interpreted as typical developmental phases or other behavioural problems. It is therefore essential that parents, caregivers, early childhood educators and teachers are aware of these signs and provide support to the child. Recognising depression in children and providing timely help are key to their health and well-being. Regular conversations, open communication and understanding are vital in supporting a child who is experiencing depression.

Children who spend more than three hours a day in front of screens have a higher risk of developing depressive symptoms. A study involving 40,337 children and adolescents showed that those who spent more time on social networks or playing video games reported higher levels of depressive

2 Cyberbullying refers to the use of digital technologies—such as the internet, social media, text messages and other electronic communication channels—to bully, harass or humiliate others. This form of violence can be particularly harmful because it can occur anywhere and at any time, providing perpetrators with both a potentially large audience and a degree of anonymity. Cyberbullying may have serious and long-term consequences for victims, including emotional consequences (sadness, depression, anxiety, low self-esteem, feelings of isolation), physical consequences (sleep problems, psychosomatic symptoms) and school-related consequences (poor academic achievement, absenteeism). Cyberbullying is a serious problem that requires concerted efforts by parents, schools, social media platforms and the wider community in order to prevent it and respond effectively. Raising awareness, education and providing support to victims are key steps in addressing this form of violence.

symptoms. A 2016 study likewise found that adolescents who spent more time on social media had a greater likelihood of developing depressive symptoms. Increased use of social networks was associated with greater social isolation and lower levels of social support.

Several studies have established that using social media before bedtime significantly increases the risk of sleep disturbances, which in turn raises the risk of depression. Poor sleep quality has been identified as a mediating factor between screen use and depression. A longitudinal study analysing the impact of exposure to negative content on adolescents' mental health found that children who were frequently exposed to violent or disturbing content were more likely to develop depressive symptoms.

1.4. Mechanisms of Influence

Excessive screen use can adversely affect children through several mechanisms that impact attention, concentration, sleep, anxiety and depression.

Attention and concentration. Digital content, particularly video games and social media, is characterised by rapid pacing and high levels of stimulation, which may reduce children's ability to maintain attention on tasks requiring sustained concentration and lower stimulation. Frequent use of digital devices promotes multitasking, leading to superficial information processing and reduced capacity to focus on a single task. Time spent in front of screens often replaces activities that foster the development of attention and concentration, such as reading, outdoor play and social interaction. Sensory overload caused by rapid alternation of visual and auditory stimuli further diminishes the ability to focus. Screen use also activates the brain's dopaminergic system, generating feelings of reward and pleasure and potentially contributing to problematic or addictive patterns of use.

Sleep. Screens emit blue light, which inhibits the production of melatonin, the hormone responsible for regulating sleep. Exposure to blue light in the evening may delay the onset of sleep and reduce its quality. Interactive content, such as video games and social media, increases arousal and mental activity, making it more difficult to relax and fall asleep. Screen time often displaces sleep time, especially among adolescents who use social networks or play video games late into the night.

Anxiety. Social media often presents idealised and unrealistic portrayals of life, which may lead to feelings of inferiority and insecurity among children and adolescents. Online harassment or abuse, commonly referred to as cyberbullying, can cause high levels of stress and anxiety. Constant exposure to information can result in feelings of being overwhelmed and an inability to process information adequately, which also increases anxiety.

Depression. Increased time spent in front of screens can reduce time for face-to-face social interaction, contributing to feelings of loneliness and depression. Sleep disorders caused by screen use, particularly before bedtime, are associated with a higher risk of depression. Exposure to negative or violent content may further elevate the risk of developing depressive symptoms.

1.5. Limiting Screen Time

Parents, caregivers and educators should establish clear rules regarding the amount of time children spend in front of screens. The American Academy of Pediatrics recommends that children under the age of two avoid screen use, while older children should use screens for no more than one to two hours per day under parental supervision. In addition, it is advisable to limit screen time particularly in the evening and to turn off screens at least one hour before bedtime in order to improve sleep quality.

It is important to encourage children to participate in activities that do not involve screens, such as reading, outdoor play, sports and social interaction. These activities not only reduce the risk of attention and concentration problems but also promote the overall development of the child. Physical activity, hobbies and spending time with peers can help reduce feelings of isolation and loneliness.

Educating parents, teachers and children about the negative consequences of excessive screen use can contribute to reducing the risk of attention problems, concentration difficulties, anxiety and depression. Programmes aimed at enhancing digital literacy can help children develop healthy technology use habits. Educational programmes can also raise awareness of the importance of sleep quality and healthy technology-use routines.

Introducing a consistent bedtime routine that includes creating a screen-free environment in the bedroom can significantly improve sleep quality among children and adolescents. Such measures can help ensure that technology has a positive rather than harmful impact on children's development and well-being.

2. Theories and Strategies for Parents, Caregivers, Educators and Teachers

Parents, caregivers, early childhood educators and teachers need to establish clear guidelines and rules concerning screen use. It is recommended that screen time for children over the age of two be limited to a maximum of two hours per day, while for younger children minimal or no exposure to screens is advised. It is also crucial to ensure that children have sufficient physical activity and opportunities for social interaction beyond digital devices.

Schools play a key role in educating children about the safe use of technology. Programmes that promote digital literacy and responsible technology use can help children develop a healthy relationship with screens. Teaching and learning processes can include activities that encourage physical activity and social interaction as a counterbalance to time spent in front of screens.

2.1. The Role of Pedagogy

Pedagogy can play a crucial role in reducing the negative effects of excessive screen use by educating parents, caregivers, educators, teachers and children themselves. Pedagogues can inform them about the harmful consequences of

excessive screen time and promote healthier habits. This includes encouraging limits on time spent in front of screens and promoting alternative activities.

Pedagogy can also advocate for the integration of digital literacy into the education system. By introducing digital literacy curricula, educators can teach children to use technology in productive and safe ways. This includes fostering critical thinking about the content they consume and understanding the impact of technology on their mental health.

Pedagogues should promote children's physical activity and outdoor play as alternatives to screen time. These activities can help reduce the risk of obesity and improve mental health. Furthermore, pedagogues can influence the development of social skills. Interactive activities that promote socialisation can help children develop stronger social competencies and reduce reliance on digital devices as the primary means of social interaction.

Every historical period has its own educational needs and therefore requires an appropriate pedagogy. Developing new pedagogical theories and strategies that respond to the problem of excessive screen use among children and adolescents—an issue that contributes to mental health difficulties—demands scientifically grounded approaches that combine insights from pedagogy, psychology and digital technology. The theories and strategies proposed here are based on scientific knowledge and are oriented towards a holistic approach to addressing excessive screen use in children and adolescents. By integrating these approaches into educational systems and curricula, it is possible to reduce the negative effects of digital technologies on the mental health of children and adolescents.

2.2. Integrative Pedagogy of Digital Awareness

The integrative pedagogy of digital awareness is based on combining technological education with conscious and reflective use of digital media. Its aim is to foster in children and adolescents an awareness of the effects of excessive screen use and to encourage them to maintain a balance between digital and physical activities.

This requires the development of digital literacy programmes, that is, the introduction of curricula that teach children safe and mindful use of technology. Such programmes include modules on managing screen time, recognising signs of digital fatigue and using technology in ways that support mental health.

It is also important to incorporate mindfulness[3] based techniques into school curricula in order to help children become more aware of their digital

3 Mindfulness is the practice of purposeful, non-judgemental awareness of the present moment. It involves intentionally directing attention to current experiences—thoughts, feelings and bodily sensations—while accepting them without trying to change or avoid them. Mindfulness can be practised through formal meditative exercises, such as meditation itself, or through everyday activities, such as eating, walking or even washing dishes, carried out with full awareness of each moment. This practice has been integrated into Western psychological and health-care approaches. Examples include Mindfulness-Based Stress Reduction (MBSR) and Mindfulness-Based Cognitive Therapy (MBCT), which have been empirically shown to be effective in reducing stress and alleviating various psychological difficulties, including anxiety and depression.

habits. This may include breathing exercises, meditation and activities that promote focusing on the present moment without screens.

Equally important are parental education programmes, which can be implemented as part of school activities or as extracurricular initiatives. These programmes can educate parents about the importance of setting boundaries on screen use and encouraging activities that involve physical play, reading and social interaction.

2.3. Team-Based Pedagogy of Digital Resilience

The team-based pedagogy of digital resilience emphasises the development of children's and adolescents' resilience to the negative effects of excessive screen use through team-oriented and interactive learning methods.

It is necessary to design and implement interactive projects within school curricula. This means including projects that require teamwork and minimal screen use—for example, group assignments, model building, or field activities that encourage students to collaborate and engage in physical interaction.

Attention should also be given to social and emotional learning. Schools should implement social-emotional learning programmes that help children develop skills such as self-awareness, self-regulation, social awareness, relationship skills and responsible decision-making.

It would be desirable for schools to organise regular "digital detox days". On such days, students would spend the entire school day without digital devices, focusing on activities that promote physical and mental health.

2.4. Adaptive Pedagogy of Technological Balance

The adaptive pedagogy of technological balance is based on adjusting technological resources to achieve equilibrium between their use and the preservation of children's and adolescents' mental health.

To achieve this, curricula should be designed and adapted to include a balanced approach to technology use. This implies reducing screen-based tasks where learning objectives can be met without digital devices and increasing activities that promote critical thinking and practical skills.

It is then necessary to individualise learning plans. Teachers should create individualised learning plans that take into account each student's needs and preferences regarding technology use, ensuring that every child has the opportunity to develop talents and skills in a way that is least harmful to their mental health.

Pedagogues and teachers should promote "screen-free pedagogical practice" in schools. Promoting screen-free practice involves implementing teaching methods that do not require digital devices. This can include traditional teaching methods, role-playing, discussions and physical activities that encourage students to learn without relying on technology.

Conclusion

Excessive screen use and its impact on children's mental health is a complex issue that requires further research, particularly in Croatia, where this problem has been largely neglected. This chapter highlights the need for careful management of the time children spend in front of screens. Parents, caregivers, educators and teachers should be aware of potential risks and take steps to ensure balanced and safe use of digital devices.

Recommendations include setting clear limits on screen time, promoting alternative activities and ensuring that children do not use devices immediately before bedtime. Attention problems, sleep disturbances, anxiety and depression are only some of the potential risks associated with excessive screen use. However, through appropriate management and education, these negative impacts can be reduced.

Parents, caregivers, educators and schools have a crucial role in ensuring safe and balanced technology use. Current research findings clearly indicate an association between excessive screen use and negative effects on the mental health of children and adolescents. The amount of time children and adolescents spend in front of screens exceeds expert recommendations, which implies a need for education, prevention and early intervention. Experts recommend that children under the age of two should not use screens at all, and that, thereafter, screen time should be limited to a maximum of two hours per day with active parental involvement.

It is necessary to introduce clear rules regarding screen use and to promote "technology-free zones" during certain parts of the day, such as meal times and the period before sleep. Pedagogy has a key role in mitigating the negative effects of excessive screen use on children because it can provide valuable theories, strategies and tools for addressing this challenge.

Educating parents, teachers and children, promoting healthier ways of using digital devices, integrating digital literacy, encouraging physical activities and developing social skills are some of the strategies that pedagogues can employ. Through these interventions, pedagogues can help children develop healthier relationships with technology, which may positively influence their mental health.

Through joint efforts, we can support children and adolescents in growing up and developing in the digital age in ways that safeguard and promote their mental health and overall well-being.

REFERENCES

American Academy of Pediatrics. (2016). Media and young minds. Pediatrics, 138(5), e20162591. https://doi.org/10.1542/peds.2016-2591

Biddle, S. J. H., & Asare, M. (2011). Physical activity and mental health in children and adolescents: A review of reviews. British Journal of Sports Medicine, 45(11), 886–895.

Cain, N., & Gradisar, M. (2010). Electronic media use and sleep in school-aged children and adolescents: A review. Sleep Medicine, 11(8), 737–740.

Carter, B., Rees, P., Hale, L., Bhattacharjee, D., & Paradkar, M. S. (2016). Association between portable screen-based media device access or use and sleep outcomes. JAMA Pediatrics, 170(12), 1206–1206.

Christakis, D. A. (2009). The effects of infant media usage: What do we know and what should we learn? Acta Paediatrica, 98(1), 10–12.

Christakis, D. A. (2011). The effects of fast-paced cartoons. Pediatrics, 128(4), 771–773.

Christakis, D. A., Ebel, B. E., Rivara, F. P., & Zimmerman, F. J. (2004). Television, video and computer game usage in children under 11 years of age. Journal of Pediatrics, 145(5), 652–654.

Gentile, D. A., Reimer, R. A., Nathanson, A. I., Walsh, D. A., & Eisenmann, J. C. (2014). Protective effects of parental monitoring of children's media use: A prospective study. JAMA Pediatrics, 168(5), 480–482.

Hale, L., & Guan, S. (2015). Screen time and sleep among school-aged children and adolescents: A systematic literature review. Sleep Medicine Reviews, 21, 55–57.

Hawi, N. S., & Samaha, M. (2016). The relations among social media addiction, self-esteem, and life satisfaction in university students. Social Science Computer Review, 35(5), 580–583.

Juster, R. P., McEwen, B. S., & Lupien, S. J. (2015). Allostatic load biomarkers of chronic stress and impact on health and cognition. Neuroscience & Biobehavioral Reviews, 35(1), 7–12.

Kowalski, R. M., Giumetti, G. W., Schroeder, A. N., & Lattanner, M. R. (2014). Bullying in the digital age: A critical review and meta-analysis of cyberbullying research among youth. Psychological Bulletin, 140(4), 1011–1121.

Lin, L. Y., Sidani, J. E., Shensa, A., Radovic, A., Miller, E., Colditz, J. B., Hoffman, B. L., Giles, L. M., & Primack, B. A. (2016). Association between social media use and depression among U.S. young adults. Depression and Anxiety, 33(4), 327–330.

Livingstone, S. (2014). Developing social media literacy: How children learn to interpret risky opportunities on social network sites. Communications, 39(3), 290–296.

Mindell, J. A., & Owens, J. A. (2015). A clinical guide to pediatric sleep: Diagnosis and management of sleep problems. In Principles and practice of pediatric sleep medicine (pp. 88–91). Philadelphia, PA: Elsevier.

Ophir, E., Nass, C., & Wagner, A. D. (2009). Cognitive control in media multitaskers. Proceedings of the National Academy of Sciences, 106(37), 15584–15585.

Primack, B. A., Swanier, B., Georgiopoulos, A. M., Land, S. R., & Fine, M. J. (2009). Association between media use in adolescence and depression in young adulthood: A longitudinal study. Archives of General Psychiatry, 66(2), 184–187.

Przybylski, A. K., & Weinstein, N. (2017). A large-scale test of the Goldilocks hypothesis: Quantifying the relations between digital-screen use and the mental well-being of adolescents. Psychological Science, 28(2), 204–215.

Rideout, V., & Robb, M. B. (2019). The Common Sense Census: Media use by tweens and teens. San Francisco, CA: Common Sense Media.

Roberts, J. A., Yaya, L. H. P., & Manolis, C. (2014). The invisible addiction: Cell-phone activities and addiction among male and female college students. Journal of Behavioral Addictions, 3(4), 254–265.

Roberts, R. E., Yaya, L. H., & Manolis, C. E. (2013). The influence of media on sleep in preadolescent children. Pediatrics, 128(1), 31–33.

Roje Đapić, M., Buljan Flander, G., & Selak Bagarić, E. (2020). Mala djeca pred malim ekranima: Hrvatska u odnosu na Europu i svijet [Young children in front of small screens: Croatia in comparison with Europe and the world]. Napredak, 161(1–2), 45–61.

Rosen, L. D., Lim, A. F., Felt, J., Carrier, L. M., Cheever, N. A., Lara-Ruiz, J. M., Mendoza, J. S., & Rokkum, J. (2014). Media and technology use predicts ill-being among children, preteens and teenagers independent of the negative health impacts of exercise and eating habits. Computers in Human Behavior, 35, 369–372.

Steeves, V. (2014). Young Canadians in a wired world, Phase III: Life online. Ottawa, Canada: MediaSmarts.

Swing, E. L., Gentile, D. A., Anderson, C. A., & Walsh, D. A. (2010). Television and video game exposure and the development of attention problems. Pediatrics, 126(2), 216–218.

Twenge, J. M., & Campbell, W. K. (2018). Associations between screen time and lower psychological well-being among children and adolescents: Evidence from a population-based study. Preventive Medicine Reports, 12, 279–281.

Woods, H. C., & Scott, H. (2016). #Sleepyteens: Social media use in adolescence is associated with poor sleep quality, anxiety, depression and low self-esteem. Journal of Adolescence, 51, 41–49.

ABOUT THE AUTHOR

Marjan NINČEVIĆ is an Assistant Professor of Pedagogy at the Faculty of Croatian Studies, University of Zagreb, where he teaches Didactics and other pedagogy courses. The scientific and research interests of Marjan Ninčević focus on the field of general pedagogy and school pedagogy, as well as on research into the competence profile of teachers within the curriculum of the contemporary school. Throughout his scholarly work, he advocates the competence profile of the contemporary teacher, the need to raise the quality of the educational process, the importance of teachers' professional development, and the development of intercultural competences. He promotes the application of cognitive cybernetics, supported by intelligent technologies, in reforms of schooling, education and training.

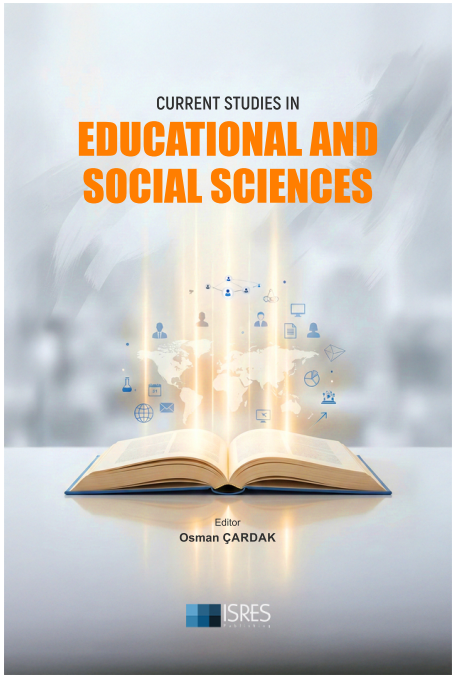
Similarity Index

The similarity index obtained from the plagiarism software for this book chapter is 7 %.

To Cite This Chapter:

Ninčević, M. (2025). The Impact of Screen Use on the Mental Health of Children and Adolescents. In O. Cardak (Ed.), *Current Studies in Educational and Social Sciences 2025* (pp. 163-174). ISRES Publishing.

ISBN: 978-625-6959-98-9



Current Studies in Educational and Social Sciences is published annually from the selected papers invited by editor.

This edition includes 2 sections and 11 papers from the field of *Current Studies in Educational and Social Sciences*

Current Studies in Educational and Social Sciences is published by ISRES Publishing.